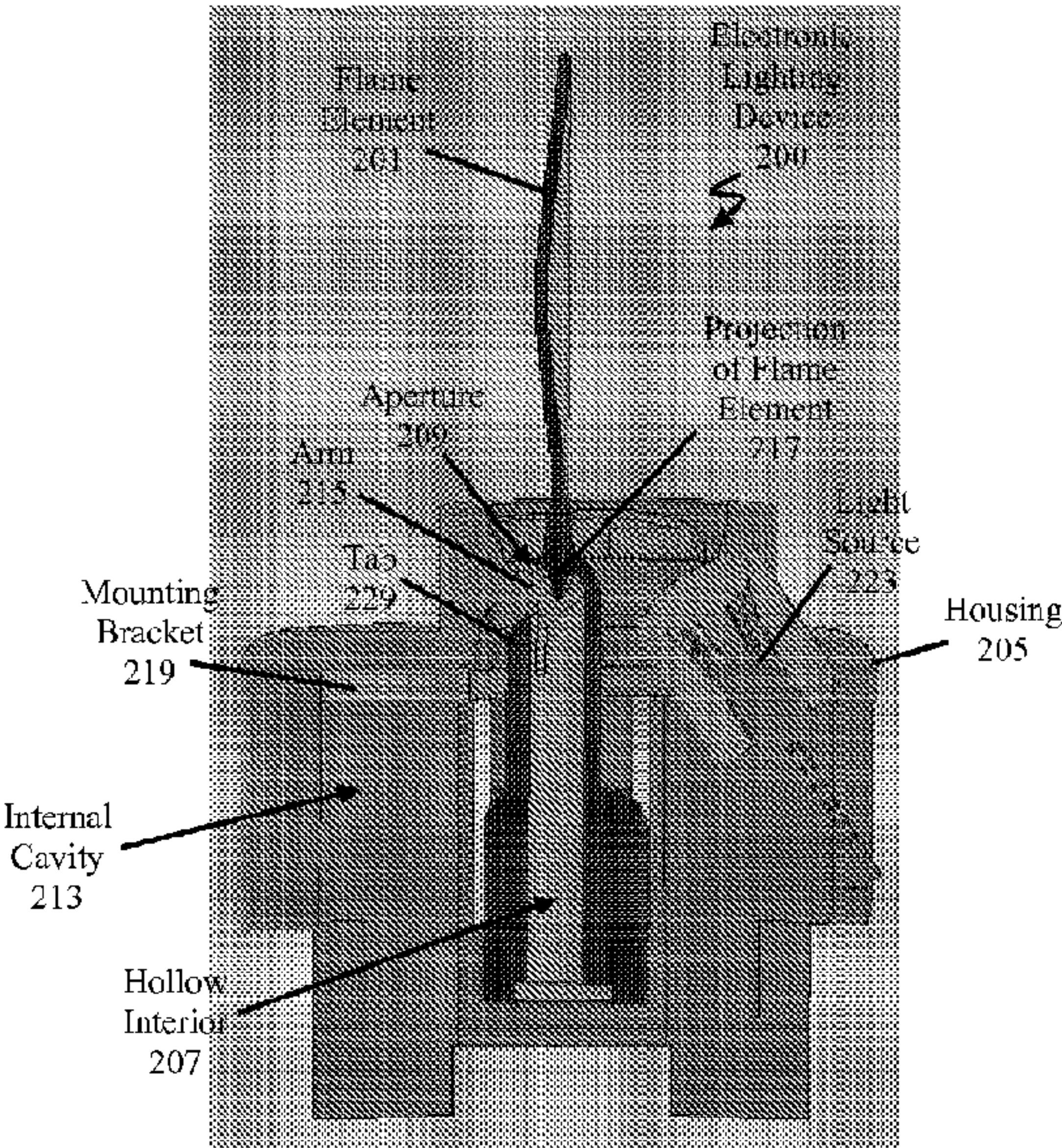




(86) Date de dépôt PCT/PCT Filing Date: 2015/08/05	(51) Cl.Int./Int.Cl. <i>F21L 2/00</i> (2006.01), <i>F21S 2/00</i> (2016.01)
(87) Date publication PCT/PCT Publication Date: 2016/02/11	
(45) Date de délivrance/Issue Date: 2018/09/11	(72) Inventeurs/Inventors: PATTON, DOUGLAS, US; LABELLE, JAMES, US; THOMPSON, JEFFREY, US
(85) Entrée phase nationale/National Entry: 2017/01/27	
(86) N° demande PCT/PCT Application No.: US 2015/043860	(73) Propriétaire/Owner: L&L CANDLE COMPANY, LLC, US
(87) N° publication PCT/PCT Publication No.: 2016/022721	(74) Agent: AVENTUM IP LAW LLP
(30) Priorités/Priorities: 2014/08/05 (US62/033,307); 2014/08/05 (US62/033,294); 2014/08/25 (US62/041,595); 2014/09/04 (US62/046,113); 2014/10/14 (US62/063,808); 2014/11/07 (US62/076,534); 2014/12/08 (US62/089,089); 2015/01/07 (US62/100,808); 2015/08/05 (US14/819,146)	

(54) Titre : DISPOSITIFS D'ECLAIRAGE ELECTRIQUES
(54) Title: ELECTRIC LIGHTING DEVICES



(57) Abrégé/Abstract:
Various components for artificial candles and other lighting devices are described that can be used to create a realistic flame effect in the devices. The devices include a flame element that extends upwardly from a housing. A light source can be disposed with respect to the flame element such that the flame element is illuminated. A variety of drive mechanisms could be disposed within the body of the device that can cause movement of the flame element with respect to the housing. The flame element can be coupled to a housing or mounting bracket of the device using various components to suspend the flame element within the housing.

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<i>F21L 2/00</i> (2006.01) <i>F21S 2/00</i> (2016.01)	
(21) International Application Number:	(72) Inventors: PATTON, Douglas; 15 Bloomdale, Irvine, California 92614 (US). LABELLE, James; 10911 Valley View Road, Eden Prairie, Minnesota 55344 (US). THOMPSON, Jeffrey; 8276 Roma Drive, Huntington Beach, California 92646 (US).
PCT/US2015/043860	
(22) International Filing Date:	(74) Agents: DEAN, Ryan S. et al.; Fish & Tsang LLP, 2603 Main Street, Suite 1000, Irvine, California 92614 (US).
5 August 2015 (05.08.2015)	
(25) Filing Language: English	
(26) Publication Language: English	
(30) Priority Data:	(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC,
62/033,307 5 August 2014 (05.08.2014) US	
62/033,294 5 August 2014 (05.08.2014) US	
62/041,595 25 August 2014 (25.08.2014) US	
62/046,113 4 September 2014 (04.09.2014) US	
62/063,808 14 October 2014 (14.10.2014) US	
62/076,534 7 November 2014 (07.11.2014) US	
62/089,089 8 December 2014 (08.12.2014) US	
62/100,808 7 January 2015 (07.01.2015) US	
14/819,146 5 August 2015 (05.08.2015) US	

[Continued on next page]

(54) Title: ELECTRIC LIGHTING DEVICES

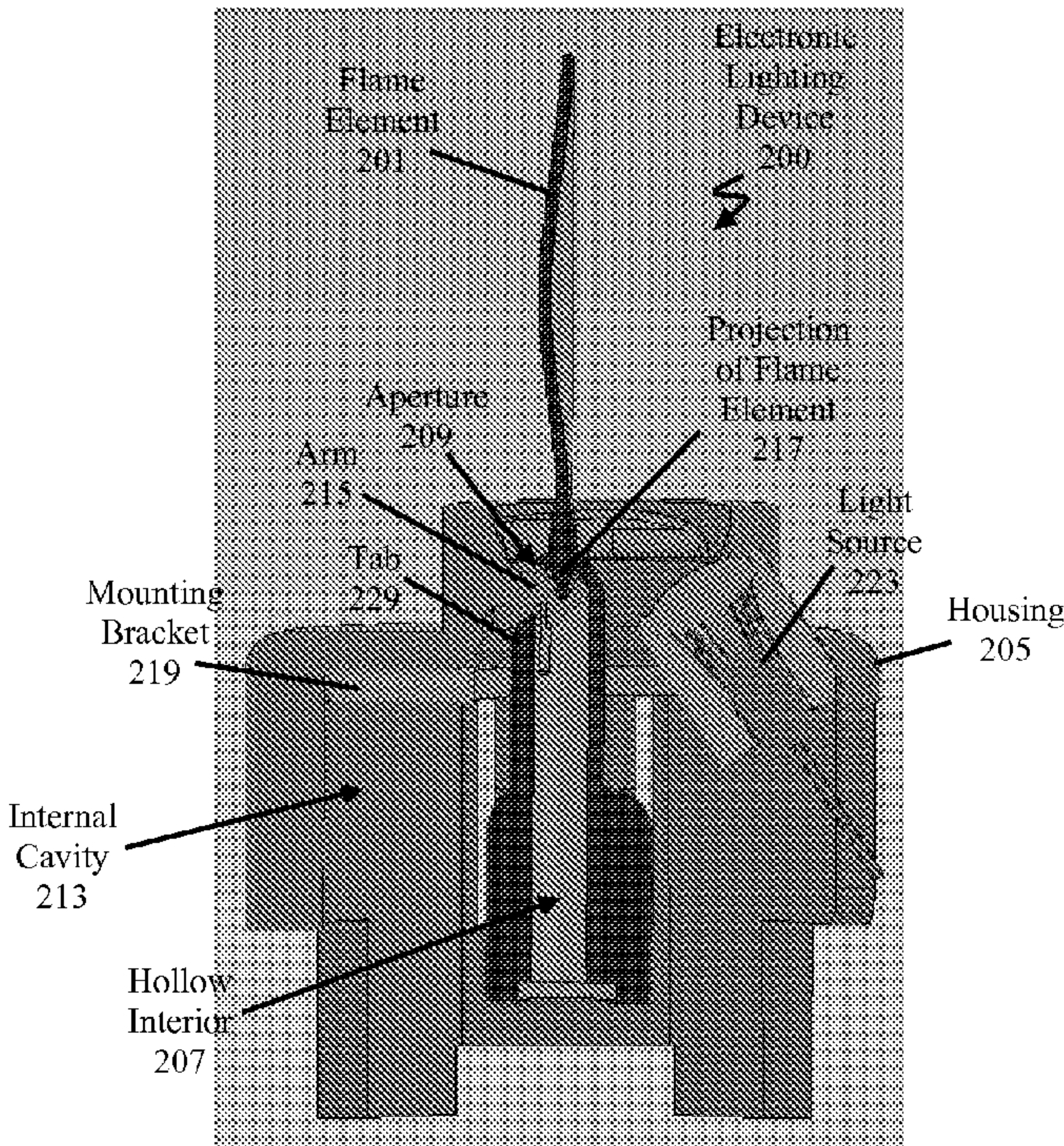


Figure 2D

(57) Abstract: Various components for artificial candles and other lighting devices are described that can be used to create a realistic flame effect in the devices. The devices include a flame element that extends upwardly from a housing. A light source can be disposed with respect to the flame element such that the flame element is illuminated. A variety of drive mechanisms could be disposed within the body of the device that can cause movement of the flame element with respect to the housing. The flame element can be coupled to a housing or mounting bracket of the device using various components to suspend the flame element within the housing.

WO 2016/022721 A4



SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,
TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available):* ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE,

SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report (Art. 21(3))*
— *with amended claims and statement (Art. 19(1))*
Date of publication of the amended claims and statement: 24 March 2016

ELECTRIC LIGHTING DEVICES

[0001] This paragraph is intentionally left as blank.

Field of the Invention

[0002] The field of the invention is electronic lighting devices, and in particular, electric candles.

Background

[0003] The background description includes information that may be useful in understanding the present invention. It is not an admission that any of the information provided herein is prior art or relevant to the presently claimed invention, or that any publication specifically or implicitly referenced is prior art.

[0004] Various electric lights are known in the art. See, *e.g.*, US 8132936 to Patton *et al.*, US 8070319 to Schnuckle *et al.*, US 7837355 to Schnuckle *et al.*, US 7261455 to Schnuckle *et al.*, US 7159994 to Schnuckle *et al.*, US 2011/0127914 to Patton *et al.*, US 7350720 to Jaworski *et al.*; US 2005/0285538 to Jaworski *et al.* (publ. Dec. 2005); US 7481571 to Bistritzky *et al.*; US 2008/0031784 to Bistritzky *et al.* (publ. Feb. 2008); US 2006/0125420 to Boone *et al.* (publ. June 2006); US 2007/0127249 to Medley *et al.* (publ. June 2007); US 2008/0150453 to Medley *et al.* (publ. June 2008); US 2005/0169666 to Porchia, *et al.* (publ. Aug. 2005); US 7503668 to Porchia, *et al.*; US 7824627 to Michaels, *et al.*; US 2006/0039835 to Nottingham *et al.* (publ. Feb. 2006); US 2008/0038156 to Jaramillo (publ. Feb. 2008); US 2008/0130266 to DeWitt *et al.* (publ. June 2008); US 2012/0024837 to Thompson (publ. Feb. 2012); US 2011/0134628 to Pestl *et al.* (publ. June 2011); US 2011/0027124 to Albee *et al.* (publ. Feb. 2011); US 2012/0020052 to McCavit *et al.* (publ. Jan. 2012); US 2012/0093491 to Browder *et al.* (publ. Apr. 2012); and US 2014/0218903 to Sheng.

[0005] This paragraph is intentionally left as blank.

[0006] However, there is still a need in the art for improved electric candles and other lighting devices.

Summary of the Invention

[0007] The present invention provides apparatus, systems, and methods in which an electronic lighting device (*e.g.*, an artificial candle) comprises components that provide numerous configurations of electronic lighting devices while at the same time maintaining a simulation of a real candle flame.

[0007A] According to one aspect of the present invention, there is provided an electronic lighting device, comprising: a flame element comprising a hollow interior and an aperture disposed on a sidewall of the flame element, wherein the flame element comprises a tab that extends from the sidewall of the flame element into the aperture; a housing comprising an internal cavity; an arm that extends horizontally from the housing and has a first end disposed in a central area of the internal cavity, wherein the arm comprises a projection; wherein the arm is sized and dimensioned to extend into the aperture to suspend the flame element within the internal cavity and to allow the flame element to move with respect to the arm; and wherein the tab and the projection of the arm overlap to secure the flame element on the arm.

[0007B] According to another aspect of the present invention, there is provided an electronic lighting device, comprising: a flame element comprising a first aperture disposed on a sidewall of the flame element and a second aperture on a bottom surface of the flame element, wherein the flame element further comprises a hollow interior that extends from the first aperture to the second aperture; a housing comprising an internal cavity; an arm that extends horizontally from the housing and ends within a central area of the internal cavity; and wherein the arm is sized and dimensioned to extend horizontally through the first aperture and not the second aperture to suspend the flame element within the internal cavity to allow the flame element to move with respect to the arm.

[0007C] According to yet another aspect of the present invention, there is provided an electronic lighting device, comprising: a flame element comprising a hollow interior and an aperture disposed on a sidewall of the flame element, wherein the flame element has a projection that extends downward into the hollow interior, and wherein the flame element comprises a tab that is defined by the sidewall and forms part of the aperture; a housing comprising an internal cavity; an arm that extends horizontally from the housing through the aperture and terminates within the hollow interior; wherein the arm has a recess and wherein the projection of the flame element rests within the recess to allow the flame element to move while the projection of the flame element rests within the recess; and wherein the tab and a

projection of the arm overlap to secure the flame element on the arm to secure the flame element on the arm.

[0007D] According to still another aspect of the present invention, there is provided an electronic lighting device having a housing and a mounting bracket that removably couples to the housing, comprising: a flame element at least partially disposed within the housing and having a flame-shaped portion and a body portion, wherein a clip is disposed on the flame element; and a mounting rod that is sized and dimensioned to couple the flame element to the housing by engaging the clip so as to allow movement of the flame element with respect to the housing while the flame element is coupled to the housing.

[0007E] According to a further aspect of the present invention, there is provided an electronic lighting device, comprising: a flame element having a flame-shaped portion and a body portion, wherein the flame-shaped portion has a face that extends from a left side of the flame element to a right side of the flame element; an aperture that extends through the body portion from the left side of the flame element to the right side of the flame element; and a mounting bracket configured to receive a support wire, wherein the support wire extends inwardly through the aperture to support the flame element.

[0007F] According to yet a further aspect of the present invention, there is provided an electronic lighting device, comprising: a flame element; a mounting bracket; a housing comprising an internal cavity and an arm that extends from the housing, wherein the housing is manufactured as a single piece, and wherein the arm is formed by a portion of the housing; wherein the flame element is suspended in the housing by the arm; and wherein the housing is sized and dimensioned to receive the mounting bracket in the internal cavity, such that the mounting bracket snap fits into the housing.

[0007G] According to still a further aspect of the present invention, there is provided an electronic lighting device, comprising: a mounting bracket having a slit that extends vertically into the mounting bracket; a housing having an internal cavity, wherein the housing is manufactured as a single piece; a flame element that is suspended in the housing by a support wire that extends from the slit in the mounting bracket; and wherein the housing is sized and dimensioned to receive the mounting bracket in the internal cavity.

[0008] In one aspect, an electronic lighting device comprises a flame element and a housing. The flame element has an aperture disposed on a sidewall and a hollow interior. The housing comprises an internal cavity and an arm that extends horizontally into the cavity. The arm of the housing is sized and dimensioned to extend through the aperture to suspend the flame element within the cavity, such that the flame element is allowed to move with respect to the housing. It is preferred that the flame element has a projection that extends downward into a recess of the arm to allow movement of the flame element while the projection rests within the recess. It should be appreciated that this movement is at least one factor that allows the flame element to simulate the movement of a real candle flame.

[0009] While it is contemplated that the flame element moves while it is suspended on the arm, the flame element is typically secured to prevent unintentionally or undesired removal of the flame element from the arm and thereby reduce the risk of the flame element from falling or separating from the arm. For example, the flame element can comprise an upward or downward tab that is defined by a sidewall and forms part of the aperture, and the arm of the housing can have a downward or upward projection, respectively, such that the tab and the projection of the arm overlap to secure the flame element on the arm while the flame element is suspended on the arm. In other words, at least one of the tab and projection of the arm has

a length that extends over and partly covers the length of the other, such that the flame element snaps on to the arm of the housing. Thus, it is contemplated that the tab is a flexible material. While flame element is secured to the arm, it should be appreciated that flame element can be removed and replaced in the electronic lighting device. In other contemplated embodiments, the arm can be removably coupled to the housing, such that the flame element can be suspended on to the arm, and then the arm can be coupled to the housing to suspend the flame element from the arm and within the housing.

[0010] Additionally, or alternatively, a pin can be used to secure the flame element to the housing. It is contemplated that the pin is sized and dimensioned to extend through a second aperture of the flame element and into the hollow interior to secure the flame element on the arm. The pin can have a recess that is configured to receive a downward projection of the arm to secure the flame element on the arm. The size of the pin can vary to secure the flame element. For example, the pin can have a first diameter and the hollow interior has a second diameter, wherein the first diameter and the second diameter are preferably within 10% of each other.

[0011] As mentioned above, the flame element can have a downward projection that rests within a recess of the arm to suspend the flame element. However, it is also contemplated that a concave apex defines an upper portion of the hollow interior of the flame element. In such embodiment, the arm can have an upward projection, such that the concave apex rests on the upward projection to allow movement of the flame element while the flame element is suspended on the arm. It should be appreciated that flame element can have a tab to further secure the flame element to the arm as discussed above.

[0012] In another aspect, an electronic lighting device comprises a flame element and a housing. The flame element has a first aperture disposed on a sidewall and a second aperture on a bottom surface of the flame element. The housing comprises an internal cavity and an arm that extends horizontally into the cavity. The arm is sized and dimensioned to extend through the first aperture to suspend the flame element within the cavity so as to allow movement of the flame element with respect to the housing. For example, the flame element can have a projection that extends downward to rest within a recess of the arm so as to allow movement of the flame element while the flame element is suspended.

[0013] Similar to the aspect described above, it is contemplated that at least one of a pin and a tab can be used to secure the flame element onto the arm while the flame element is suspended. For example, the pin can be sized and dimensioned to extend through the second aperture and into a hollow interior of the flame element to secure the flame element on the arm. The pin can have a first diameter and the hollow interior can have a second diameter, such that the first diameter and the second diameter are preferably within 10% of one another.

[0014] The flame element preferably comprises a hollow interior and an aperture disposed on one sidewall of the flame element. An arm extends horizontally from the housing into an internal cavity and through the aperture of the flame element and into the flame element's cavity. The arm preferably has a recessed area and the flame element has a projection that extends downward into the hollow interior. The projection of the flame element rests within the recessed area so as to allow movement of the flame element in two or more dimensions while the projection rests within the recessed area.

[0015] In another aspect, the flame element can include a clip that is disposed on or is adjacent to a flame-shaped portion, which is configured to couple the flame element to a mounting rod. The mounting rod is sized and dimensioned to engage the clip to allow movement of the flame element with respect to the housing while the flame element is coupled to the mounting rod. It should be appreciated that allowing the flame element to move while it is coupled to the housing is at least one factor that allows the flame element to simulate the movement of a real candle flame.

[0016] In another aspect, an electronic lighting device comprises a flame element, a mounting bracket and a support wire. The flame element comprises a flame-shaped portion and a body portion. The flame-shaped portion has a face and the body portion comprises an aperture that extends through the body portion in a direction substantially parallel to the face, wherein substantially is within 15 degrees, and more typically within 5 degrees of parallel. In other words, the aperture does not extend in a direction into the face, but in a direction that extends across the length of the face. As used herein, "face" means the major surface of flame-shaped portion of the flame element.

[0017] The mounting bracket is configured to receive a support wire that extends inwardly through the aperture to suspend the flame element within the mounting bracket. The support wire can be supported by the mounting bracket in a number of suitable ways. For example,

the mounting bracket can have a slit that is sized and dimensioned to receive the support wire. In another example, the support wire can be coupled to the mounting bracket by a fastener.

[0018] It should be appreciated that the flame element is suspended in a manner that allows movement, such that the flame element can simulate the movement of a real candle light. It is contemplated that the flame-shaped portion has a first weight and the body portion has a second weight, and the second weight is greater than the first weight. Thus, the center of mass of the flame element can be below the aperture, such that the flame element remains upright. Additionally, or alternatively, the body portion comprises an elongated portion and a base portion, wherein the elongated portion has a smaller cross-sectional area than the base portion.

[0019] The flame element is typically suspended so that the flame-shaped portion extends above the mounting bracket. Additionally, a housing with a top opening can be removably coupled to the mounting bracket. In such embodiment, it is contemplated that the support wire is positioned below the top opening, and that at least part of the flame element extends above the top opening. Thus, it should be appreciated that the visibility of the support wire is reduced.

[0020] The electronic lighting device can further comprise a light source. The light source can rest within a groove on the mounting bracket. It is contemplated that the support wire and the light source are positioned so that the support wire does not block light emitted from the light source. Thus, the support wire can be positioned in the mounting bracket so that no shadow is created on the flame element from the light emitted from the light source.

[0021] One should appreciate that the disclosed subject matter provides many advantageous technical effects including providing various designs of an artificial candle that simulate a real candle light. Thus, many drawbacks of conventional methods of providing an artificial candle can be reduced, and even possibly eliminated, by the disclosed subject matter.

[0022] Various objects, features, aspects and advantages of the inventive subject matter will become more apparent from the following detailed description of preferred embodiments, along with the accompanying drawing figures in which like numerals represent like components.

Brief Description of the Drawings

[0023] **Figures 1A and 1B** are a front view and back view, respectively, of an embodiment of an electronic lighting device.

[0024] **Figure 1C** is a cross-sectional view of the electronic lighting device in Fig. 1A.

[0025] **Figure 1D** is an enlarged view of the upper region of the cross-sectional view in Fig. 1C.

[0026] **Figures 2A and 2B** are a front view and side view, respectively, of another embodiment of an electronic lighting device.

[0027] **Figure 2C** is an exploded view of the electronic lighting device in Fig. 2A.

[0028] **Figure 2D** is a cross-sectional view of the electronic lighting device in Fig. 2A.

[0029] **Figure 3A** is a front perspective view of an embodiment of a flame element.

[0030] **Figure 3B** is a back perspective view of the flame element in Fig. 3A.

[0031] **Figure 3C** is a bottom perspective view of the flame element in Fig. 3A.

[0032] **Figure 3D** is a cross-sectional view of the flame element in Fig. 3A.

[0033] **Figure 4A** is a front perspective view of an embodiment of a housing.

[0034] **Figure 4B** is a back perspective view of the housing in Fig. 4A.

[0035] **Figure 4C** is a cross-sectional view of the housing in Fig. 4A.

[0036] **Figure 5A** is a front view of an embodiment of an electronic lighting device having a pin.

[0037] **Figure 5B** is an exploded view of the electronic lighting device in Fig. 5A.

[0038] **Figure 5C** is a cross-sectional view of the electronic lighting device in Fig. 5A.

[0039] **Figure 5D** is an enlarged view of a region of the cross-sectional view in Fig. 5C.

[0040] **Figures 6A and 6B** are cross-sectional views of an embodiment of a portion of a flame element showing a concave apex.

[0041] **Figure 7A** is a top view of an embodiment of an electronic lighting device having a flame element with a wire clip.

[0042] **Figures 7B** is an exploded view of the electronic lighting device in Fig. 7A.

[0043] **Figures 7C and 7D** are a perspective view and a side view, respectively, of the flame element in the electronic lighting device in Fig. 7A.

[0044] **Figure 7E** is an enlarged view of the wire clip of Fig. 7A.

[0045] **Figure 8A** is a top view of an embodiment of an electronic lighting device having a flame element with an arch.

[0046] **Figure 8B** is an exploded view of the electronic lighting device in Fig. 8A.

[0047] **Figure 8C** is a perspective view of the flame element in the electronic lighting device in Fig. 8A.

[0048] **Figure 9A** is an exploded view of an embodiment of an electronic lighting device.

[0049] **Figure 9B** is an enlarged view of the mounting rod coupled to the clip in the electronic lighting device in Fig. 9A.

[0050] **Figure 9C** is a cross-sectional view of the electronic lighting device in Fig. 9A.

[0051] **Figure 9D** is a perspective view of the flame element in the electronic lighting device in Fig. 9A.

[0052] **Figure 10A** is a perspective view of an embodiment of an electronic lighting device having a transverse support wire.

[0053] **Figure 10B** is a cross-sectional view of the electronic lighting device in Fig 10A.

[0054] **Figures 10C and 10D** is a perspective view and side view, respectively, of the flame element of the electronic lighting device in Fig. 10A.

[0055] Figures 11A and 11B are top views of an embodiment of an electronic lighting device having a removable arm.

Detailed Description

[0056] The following discussion provides example embodiments of the inventive subject matter. Although each embodiment represents a single combination of inventive elements, the inventive subject matter is considered to include all possible combinations of the disclosed elements. Thus if one embodiment comprises elements A, B, and C, and a second embodiment comprises elements B and D, then the inventive subject matter is also considered to include other remaining combinations of A, B, C, or D, even if not explicitly disclosed.

[0057] The inventor has discovered that electronic lighting devices can be produced using various designs without reducing the ability to simulate a real candle light. Specifically, the flame element can be suspended using a variety of means without sacrificing the ability to mimic a real candle light. For example, the flame element can be mounted on an arm of the housing. In another example, the flame element can have a clip configured to couple with a mounting rod. Indeed, it should be appreciated that the support structures for suspending flame element are hidden, such that they are not readily visible to users and do not cast a shadow on the flame element by light emitted from a light source of the electronic lighting device. Thus, various electronic lighting devices are disclosed that mimic a real candle light.

[0058] In Figures 1A-1D, an electronic lighting device 100 comprises a flame element 101 and an outer shell 103. Flame element 101 is partially housed within outer shell 103, such that flame element 101 is allowed to move in a manner that simulates a moving flame. For example, a circuit board can control a drive mechanism, which could be an electromagnet, a fan, or other component that creates kinetic motion on flame element 101 to simulate the movement of a moving flame. A detailed description of an exemplary internal configuration for an electronic lighting device that is configured to move a flame element can be found in co-pending PCT application PCT/US15/11642.

[0059] Outer shell 103 can have a scented or unscented wax coating and an uneven top ridge 102, as shown in Fig. 1B, to match the appearance of a real candle. It is contemplated that there are various components housed within outer shell 103 that cooperate to operate electronic lighting device 100. For example, Fig. 1C shows a cross-sectional view of electronic lighting device 100 where a circuit board 104 and flame element 101 is at least

partially disposed within outer shell 103. Another contemplated part disposed within outer shell 103 is a light controlling material, such as an opaque layer, which reduces or prevents light from bleeding through all or a portion of the outer shell 103. For example, a opaque inner material can surround an interior perimeter of the outer shell 103, such that light from a light source within electronic lighting device 100 is not seen through outer shell 103. In another example, electronic lighting device 100 can comprise a thin layer, typically plastic, adjacent to outer shell 103 to prevent light from a light source within electronic lighting device 100 to be seen through outer shell 103. While the thin layer can be disposed throughout all the areas within outer shell 103, it is contemplated that the thin layer can be disposed on at least one of a portion (top, center, bottom) of electronic lighting device 100. The thin layer can also be disposed around the perimeter of a light source within electronic lighting device 100 to reduce light from being emitted through the sides of the light source. In such embodiments, it is contemplated that an opaque tape or other material could be wrapped about a portion of the light source to prevent light from emanating in certain directions.

[0060] In yet another example, electronic lighting device 100 can include an opaque interior chassis in at least a portion of electronic lighting device 100. It should be appreciated that these light controlling materials will enhance the simulation of electronic lighting device 100 to mimic a real candle by limiting light emitted from electronic lighting device 100 to the top as seen in various real candles.

[0061] Fig. 1D shows an enlarged view of the upper region of electronic lighting device 100. Electronic lighting device 100 comprises flame element 101 and housing 105. Flame element 101 has a hollow interior 107 and an aperture 109 disposed on a side 111 of flame element 101. Housing 105 has an internal cavity 113 and an arm 115 that extends horizontally into internal cavity 113. It should be appreciated that internal cavity 113 is sized and dimensioned to receive a portion of flame element 101. Arm 115 is sized and dimensioned to extend through aperture 109 of flame element 101 to suspend the flame element within internal cavity 113 so as to allow movement of flame element 101 with respect to housing 105. Typically, arm 115 integral with housing 105 (*i.e.*, they are formed by a single, injection-molded piece), but arm 115 can also be a separate component. For example, arm 115 can be removably coupled to housing 105 by a variety of coupling techniques (e.g., snap-fit, pressure-fit, lock-fit, rotational lock-fitting, rotational snap-fitting, using fasteners such as

screws, nuts, bolts, and/or washers), or it can be secured by another piece or pieces dedicated to hold arm 115 in housing 105. It should be appreciated that having arm 115 as a separate component of housing 105 allows a user to insert arm 115 through aperture 109 to suspend flame element 101 before suspending flame element 101 in housing 105. Once arm 115 is within aperture 109 of flame element 101, arm 115 can be coupled to housing 105 to suspend flame element 101 within internal cavity 113 of housing 105. In an exemplary embodiment, the arm 115 can slide within a recessed portion of the housing 105, and then extend generally horizontally within the housing 105 to thereby suspend the flame element 101.

[0062] It is contemplated that a projection 117 of flame element 101 rests within a recessed area of arm 115 to suspend flame element 101. Additionally, or alternatively, it is contemplated that a tab 129 disposed on a side 111 of flame element 101 reduces the risk of flame element 101 falling or separating from arm 115. This reduction in risk is at least due to tab 129 and a downward projection 137 of arm 115 overlapping, such that the height of aperture 109 is less than a height of arm 115 as measured from the top surface of arm 115 to the apex of projection 137. Thus, it is contemplated that tab 129 can be required to move to allow insertion of removal of flame element 101 from arm 115.

[0063] Electronic lighting device 100 can further comprise a light source 123 and a lens 124. Light source 123 can be an LED or another light source sufficient to emit light onto flame element 101. Lens 124 can be used can be used to focus light emitted from light source 123. It is contemplated that a light controlling material (*e.g.*, tape or other thin layer or other commercially suitable material) can be disposed on at least one an inner surface of housing 105, an outer surface of housing 105, and the perimeter of the housing for light source 123 and lens 124. Such light controlling material can prevent light from bleeding through the sides of the housing, which can reduce the ability of electronic lighting device 100 to mimic a real candle.

[0064] Flame element 101 can further include an O-ring 122 that is disposed in a channel near the bottom surface of flame element 101. It is contemplated that O-ring 122 is used to reduce the noise generated when flame element 101 bumps into housing 105 while flame element 101 is moving to simulate a moving flame. While O-ring 122 is disposed near the bottom of flame element 101, it is contemplated that O-ring 122 can be disposed in other areas of flame element 101 or that more than one O-ring 122 is disposed on flame element

101 so long as it is suitable to reduce the noise generated when flame element 101 bumps housing 105.

[0065] **Figure 2A** shows electronic lighting device 200 comprising a flame element 201 and a housing 205. Similar to the electronic lighting device of Figs. 1A-1D, flame element 201 is suspended so as to allow it to move in a manner that simulates a real candle light. **Figure 2B** shows a side view of electronic lighting device 200. Housing 205 has an upper region with a top opening 269 that has a smaller circumference than a bottom region that has a bottom opening with a larger circumference. As shown in Fig 2B, flame element 201 is suspended to extend through top opening 269 near one end (*e.g.*, front end or back end) of top opening 269. In other words, flame element 201 is not suspended to extend through the center of top opening 269. However, in other contemplated embodiments, flame element 201 is suspended to extend through the center of top opening 269.

[0066] It is contemplated that housing 205 can be manufactured as a single piece via injection molding. By creating housing 205 as a single piece, the overall complexity of the device is significantly reduced. By forming housing 205 as a single piece, the number of parts is reduced, simplifying assembly (*e.g.*, by robotic or human assembly lines).

[0067] Electronic lighting device 200 further includes a mounting bracket 219 as shown in **Figure 2C**. Mounting bracket 219 comprises a groove 221 that can be used to hold a light source 223. It should be appreciated that groove 221 extends at an angle so that light source 223 can emit light onto flame element 201 to simulate a real light candle. Furthermore, it is contemplated that a light controlling material can be disposed on at least one of an internal surface of groove 221, an internal surface of housing 205, and an external surface of housing 205.

[0068] Light source 223 can project different colors of light, though preferably it projects a color that is similar to the color of a candle flame (*e.g.*, orange, yellow, red, blue, or some combination thereof). A lens 224 is used to focus the light to a desired degree. For example, a focal length greater than the distance between the lens 224 and the flame element 201 can provide softer lighting than if the light were focused directly onto the flame element. Alternatively, the focal length can be shorter than the distance between the lens 224 and the flame element 201 to achieve substantially the same effect since with a simple lighting device (*e.g.*, an LED) the orientation of the image is irrelevant.

[0069] Mounting bracket 219 is inserted upwardly through the bottom opening of housing 205. It is contemplated that mounting bracket 219 can be coupled to housing 205 by a variety of coupling techniques (e.g., glue, epoxy, snap-fit, pressure-fit, lock-fit, rotational lock-fitting, rotational snap-fitting, using fasteners such as screws, nuts, bolts, and/or washers), or it can be secured by another piece or pieces dedicated to holding mounting bracket 219 in housing 205. Thus, it should be appreciated that housing 205 is sized and dimensioned to receive mounting bracket 219 in an internal cavity 213 as shown in **Figure 2D**.

[0070] Flame element 201 has an aperture 209 and a hollow interior 207. Housing 205 has an arm 215 that can extend into hollow interior 207, such that a projection 217 of flame element 201 rests on a recessed area of arm 215 to suspend flame element 201 in housing 205. While this embodiment shows that arm 215 extends from housing 205, it is contemplated that arm 215 can extend from mounting bracket 219 to suspend flame element 201 within housing 205. Alternatively, it is contemplated that flame element 201 has a horizontally extended channel that receives arm 215, wherein the remainder of flame element 201 is solid. Once flame element 201 is suspended on arm 215, light may be emitted from light source 223 while flame element 201 moves to simulate a moving flame. It should be appreciated that tab 229 reduces the risk of flame element 201 falling or separating from arm 215 while flame element 201 is moving to simulate a real candle light.

[0071] An exemplary flame element 301 is shown in **Figure 3A**. Flame element 301 has a flame-shaped portion 325 and a body portion 327. Flame-shaped portion 325 includes a concave surface defining a face in the shape of a flame. However, planar and other dimensional surfaces could alternatively be used. Typically, light is projected onto flame-shaped portion 325 while flame element 301 is moving with respect to the housing in order to simulate a real candle light. Body portion 327 has an aperture 309 and a tab 329 as shown in **Figure 3B**.

[0072] Tab 329 can be defined by a sidewall 311 of flame element 301. Furthermore, tab 329 can define a portion of an aperture 309 of flame element 301. Typically, tab 329 is a flexible material, such that an arm of a housing can bend tab 329 in an amount sufficient to allow the arm to enter hollow interior 307 of flame element 301 and suspend flame element 301.

[0073] As discussed above, flame element 301 can have a projection 317. Projection 317 is typically disposed in hollow interior 307. While projection 317 is shown as a cone shape, it is contemplated that other shapes are suitable, such as a sphere, a cone with a flat top, a cylinder, a cube, a rectangle, a prism, and any other shape that is would allow flame element 301 to move in a manner that simulates a real candle light while suspended in a housing.

[0074] Flame element 301 is preferably predominantly white in color, though different colors are contemplated, as well as different transparencies. Though only the flame element is explicitly described as an example, color or transparency variations discussed herein can alternatively apply to only a portion of the flame element 301. Preferably, flame-shaped portion 325 can have various colors and transparencies, but body portion 327 may also be made to have different colors or transparencies. Ideally, the flame element 301 is colored such that light projected onto it is reflected so that it is visible to a human observer.

Variations of the color white or other colors (*e.g.*, red, orange, yellow, blue, and any combination thereof, including gradient changes from one color to another and/or color blends) can be used depending on the color of light that is to be reflected. Additionally, the flame element 301 can comprise different materials or finishes depending on the desired effect. A glossy finish may be desirable in some circumstances, while in others a matte finish may be desired. The finish of the flame element material can affect how light is reflected by the flame element 301, where matte finishes would reflect the light in more directions than a glossy finish.

[0075] The thickness of the material can also affect optical qualities. For example, the thickness flame-shaped portion 325 can affect the amount of light that is able to pass through flame-shaped portion 325 by diffusion. In addition, flame-shaped portion 325 can be made from one or more materials which have varying levels of transparency, ranging from completely transparent to completely opaque. For example, in some embodiments, flame-shaped portion 325 can allow more than 50% of incident light to pass through, while other embodiments can restrict light passage to 40% of incident light, 30% of incident light, 20% of incident light, 10% of incident light, or 0% of incident light (meaning the material is substantially opaque). Some embodiments can have different transparencies in different portions flame-shaped portion 325. For example, one embodiment might be more transparent near the top of flame-shaped portion 325 and have a gradient whereby transparency at each point moving toward body portion 327 is decreased. These effects are important for devices

where light is projected onto one side of the flame element 301, but is also to be viewed on the opposite side as the light passes through.

[0076] Some embodiments of the flame element 301 can include light transmitting channels that allow light to be shined onto an area of the flame element 301 such that the light can then be seen from a different area of the flame element 301. For example, if light is shined onto body portion 327 it will then be visible from flame-shaped portion 325 of flame element 301 via the light channel. Alternatively to light channels, the flame element 301 can be made from composite materials having desirable optical qualities to produce a similar result (*e.g.*, flame element 301 can have a core and an outer coating, where the core is made from a material that is substantially transparent such that light can pass through it and the outer coating made from a material that is substantially translucent such that light is more effectively transmitted throughout the entire flame element 301).

[0077] In some embodiments, flame element 301 comprises a second aperture 331 as shown in **Figures 3C and 3D**. Second aperture 331 can be disposed on the bottom of flame element 301. It is contemplated that a recess 324 is disposed near second aperture 331. A magnet can be inserted into recess 324 that cooperates with other components of an electronic lighting device to cause flame element to move in a manner that simulates a moving flame. Hollow interior 307 can extend between aperture 309 and second aperture 331. While flame element 301 has second aperture, it is contemplated that flame element 301 can have no apertures, a single aperture or a plurality of apertures. Flame element 301 further includes a channel 333 that is circumferentially disposed near the bottom of flame element 301. An O-ring can be placed within channel 333 to provide reduce the noise that occurs when flame element 301 contacts a sidewall of a housing when flame element 301 is moving to simulate a real candle light. It should be appreciated that a magnet can be disposed on the opening of second aperture 331 thereby covering second aperture 331.

[0078] Fig. 3D shows that flame element 301 can have an asymmetric shape in body portion. Specifically, it is contemplated that a base portion 373 of body portion 327 has an asymmetric shape, such that one side is larger than its opposite side. For example, as shown in Fig. 3D, base portion 373 extends further horizontally on the side opposite of aperture 309 than base portion 373 on the side of aperture 309. However, in alternative embodiments, body portion can be symmetrical.

[0079] An exemplary housing 405 is shown in **Figures 4A and 4B**. Housing 405 can have a groove 421 where a light source can be housed. However, it is also contemplated that a mounting bracket has a groove for a light source and the housing is sized and dimensioned to receive the mounting bracket with the light source. **Figure 4C** shows that housing 405 comprises an arm 415 having a recess 435 and a projection 437. While arm 415 is part of housing 405, it is contemplated that arm 415 can be a separate component from housing 405. In such embodiments, arm 415 can be removably coupled to housing 405 through a variety of coupling techniques as described above. Recess 435 is sized and dimensioned to receive a projection from a flame element so that a flame element, as shown previously in Figs. 1D and 2D, can be suspended in housing 405. Furthermore, housing 405 has an internal cavity 409 that can receive at least one of a portion of a flame element and a mounting bracket.

[0080] It is contemplated that some embodiments can further include a pin to provide additional stability of the flame element on the arm of the housing. For example, **Figures 5A and 5B** show an electronic lighting device 500 having a flame element 501, a housing 505, and a pin 539. Pin 539 is sized and dimensioned to extend through a second aperture of flame element 501 and into the hollow interior of flame element 501 as shown in **Figure 5C**. It is contemplated that arm 515 can be removably coupled to housing 505.

[0081] Arm 515 extends into flame element 501 and has a recess 535, as shown in **Figure 5D**, which receives a projection 517 of flame element 501 that rests within recess 535 so as to allow movement of flame element 501 while projection 517 rests within recess 535. Arm 515 has a downward projection 537 that rests within a recess 541 of pin 539 to provide additional stability of flame element 501 and reduce the risk of flame element 501 from falling or separating from arm 515. It is contemplated that pin 539 has a first diameter and the hollow interior has a second diameter, wherein the first diameter and the second diameter are preferably within 10% of each other. Pin 539 can be inserted after flame element 501 is on arm 515 to secure flame element 501 on arm 515. While pin 539 can properly secure arm 515 without a tab as discussed above, it is contemplated that flame element 501 further comprises a tab.

[0082] As discussed above, electronic lighting devices can have a flame element with a projection that extends into the hollow interior and the projection rests on an arm of the housing. However, it is contemplated that a flame element 601 has a body portion 627 with a convex apex 643 that defines an upper portion of hollow interior 607 as shown in **Figures 6A**

and 6B. Similar to the embodiments described above, flame element 601 has a tab 629 and a second aperture 631. An arm 615 from a housing or mounting bracket extends within hollow interior 607 to suspend flame element. In this embodiment, arm 615 has an upward projection 645 and concave apex 643 rests on upward projection 645 so as to allow movement of flame element 601 while flame element 601 is suspended on arm 615.

[0083] It should be appreciated that tab 629 provides additional support for flame element 601 to remain on arm 615 while flame element 601 is moving to simulate a real candle light. As shown in Figs. 6A-6B, flame element 601 has a tab 629 that is defined by the sidewall and forms part of aperture 609. Arm 615 comprises a downward projection 637 and tab 629 and downward projection 637 of arm 615 overlap to secure flame element 601 on arm 615 while concave apex 643 rests on upward projection 645. In contemplated embodiments, at least one of tab 129 and downward projection 137 bends to allow flame element 101 to be removed from or placed on arm 115.

[0084] While an arm can be used to suspend a flame element in a housing, it is contemplated that other suitable components can be used to suspend the flame element without sacrificing the ability to simulate a real candle light. For example, **Figure 7A** shows an electronic lighting device 700 that comprises a flame element 701, a housing 705, a clip (e.g., a wire clip 747), and a mounting rod 749. It is contemplated that the clip is disposed on an exterior surface of the flame element, such that an aperture or through hole is not needed on flame element to suspend flame element in a housing.

[0085] Flame element 701 is at least partially disposed within housing 705 and wire clip 747 is disposed on flame element 701. Mounting rod 749 is sized and dimensioned to couple flame element 701 by engaging wire clip 747 so as to allow movement of flame element 701 with respect to housing 705 while flame element 701 is coupled to housing 705.

[0086] **Figure 7B** shows an exploded view of electronic lighting device 700. As shown, electronic lighting device can further comprise a mounting bracket 719. It is contemplated that mounting rod 749 engages wire clip 747 and engages a slot 751 on mounting bracket 719. Mounting bracket 719 can be received by housing 705 so as to suspend flame element 701 in housing 705. Additionally, or alternatively, mounting bracket 719 can receive a light source 723 that is configured to emit light onto flame element 701. While Fig. 7B shows

mounting bracket 719 configured to receive mounting rod 749, it is contemplated that mounting rod 749 can directly couple housing 705 rather than mounting bracket 719.

[0087] Flame element 701 has a flame-shaped portion 725 and a body portion 727 as shown in **Figure 7C**. Wire clip 747 is disposed on flame-shaped portion 725 of flame element 701 at one end and the opposite end is adjacent to the flame-shaped portion. It is contemplated that a mounting rod is configured to engage flame element 701 via a friction fit provided between wire clip 747 and flame element 701. Additionally, or alternatively, wire clip 747 forms a through hole 746 and a mounting rod is configured to engage wire clip 747 via through hole 746. **Figure 7D** shows a side view of flame element 701 having wire clip 747 disposed on flame-shaped portion 725 of flame element 701 on one end. It is contemplated that wire clip 747 is disposed on an opposite side of a face 767 of flame element 701. Typically, light is emitted onto face 767 to illuminate flame element 701 to simulate a real candle light. However, it is also contemplated that wire clip 747 can be disposed on face 767 of flame element 701.

[0088] While a wire clip can be used to suspend the flame element, it is contemplated that an electronic lighting device 800 comprises an arch 853 disposed on a flame element 801 as shown in **Figure 8A**. A mounting rod 849 can be configured to couple arch 853 and a housing 805 to suspend flame element 801.

[0089] Electronic lighting device 800 further comprises a mounting bracket 819, which has a slot 851 and can receive a light source 823 as shown in **Figure 8B**. Mounting rod 849 can engage arch 853 and mounting bracket 819 via slot 851. Thus, it should be appreciated that housing 805 can be sized and dimensioned to receive mounting bracket 819 to suspend flame element 801 in housing 805. Alternatively, mounting rod 849 can directly couple housing 805 to suspend flame element 801 in housing 805.

[0090] **Figure 8C** shows that arch 853 can be formed by a portion of flame element 801. However, it is contemplated that arch 853 is a separate component that is attached to flame element 801. Arch 853 can be disposed on flame-shaped portion 825, but it is also contemplated that arch 853 can be disposed on body portion 827. While arch 853 is shown in a horizontal configuration, arch 853 can be disposed in a vertical configuration.

[0091] Another electronic lighting device having a flame element with a clip is illustrated in **Figure 9A**. Electronic lighting device 900 has a housing 905, a flame element 901 and a

mounting bracket 919. Electronic lighting device 900 comprises a clip 955 that extends into a notch 957 of flame element 901. Mounting rod 949 is configured to couple clip 955 and mounting rod 949 can be inserted into slot 951 of mounting bracket 919. It should be appreciated that mounting bracket 919 can receive a light source 923 to emit light onto flame element 901. Housing 905 is sized and dimensioned to receive mounting bracket 919, such that flame element 901 is suspended in housing 905.

[0092] Figure 9B shows an enlarged view of mounting rod 949 coupled to mounting bracket 919 and clip 955. It is contemplated that clip 955 can slide into mounting rod 949 or that clip 955 and mounting rod 949 are manufactured in a coupled configuration. Mounting rod 949 can slide into slot 951 as better shown in **Figure 9C**. Thus, flame element 901 can be suspended in housing 905 to simulate a moving flame.

[0093] Figure 9D shows clip 955 disposed adjacent to a flame-shaped portion 925 of flame element 901 and extending into notch 957 in a body portion 927 of flame element 901. It is also contemplated that clip 955 is disposed on flame-shaped portion, such that notch 957 is not needed. Furthermore, an arch 959 can provide support to clip 955. As shown in Fig. 9D, clip 955 is a separate component from flame element 901. However, in other embodiments, clip can be formed by at least a portion of flame element 901.

[0094] It should be appreciated that the clips described above can be disposed on an exterior surface of the flame element. For example, the clip can be disposed on at least one of the flame-shaped portion and the body portion of the flame element. Thus, the clip supports the flame element, and eliminates the need for an aperture on the flame element and a support wire that extends through the aperture to support the flame element in the housing.

[0095] While clips as discussed above can be used to suspend a flame element to allow movement that simulates a real candle light, it is further contemplated that a support wire can also suspend a flame element. For example, **Figure 10A** shows an electronic lighting device 1000 having a flame element 1001 and a housing 1005. Flame element 1001 at least partly extends above a top opening 1069 of housing 1005. It should be appreciated that a support wire 1061 extends below top opening 1069 to reduce the visibility of support wire 1061. In preferred embodiments, the support wire 1061 is at least 2 mm below the top opening 1069, though the depth of the wire can be different in different embodiments (e.g., 1 mm, 3 mm, 4 mm, 1-2 mm, 2-3 mm, or 3-4 mm).

[0096] **Figure 10B** shows a mounting bracket 1019 that can be removably coupled with housing 1005. In other words, housing 1005 can be sized and dimensioned to receive mounting bracket 1019 in the internal cavity. Mounting bracket 1019 has a slit 1063 that is sized and dimensioned to receive support wire 1061. As shown in Fig. 10B, slit 1063 can extend vertically into mounting bracket 1019. Support wire 1061 extends from slit 1063 through an aperture 1065 of flame element 1001 in order to support flame element 1001. It should be appreciated that flame element 1001 is supported so as to allow movement of flame element 1001 to simulate a real candle light.

[0097] Support wire 1061 is preferably coupled to a mounting bracket 1019, although in some embodiments may be alternatively mounted to housing 1005. Additionally, support wire 1061 can be coupled to mounting bracket 1019 or housing 1005 in a number of ways. For example, in some embodiments the ends of the support wire 1061 can be fitted into grooves in mounting bracket 1019 or housing 1005. In other embodiments, the support wire 1061 can be glued to mounting bracket 1019 or housing 1005, while in still other embodiments it is fastened into place by a fastening technique (*e.g.*, screw, adhesive, pressure fit, having the ends of the support wire fit within receiving holes, or even material deformation of the support wire 1061 to couple it to mounting bracket 1019 or housing 1005). It is contemplated that housing 1005 has a bottom surface that overlaps slit 1063 when housing 1005 receives mounting bracket 1019, such that support wire 1061 is at least partly secured in slit 1063 by housing 1005.

[0098] Mounting bracket 1019 can further include a light source 1023 that is configured to emit light onto flame element 1001. Light source 1023 can rest within a groove 1021 of mounting bracket 1019. However, it is also contemplated that housing 1005 can have a groove configured to receive light source 1023. Nonetheless, it should be appreciated that support wire 1061 is positioned in a manner (*e.g.*, positioned below light emitted from light source 1023, positioned to extend perpendicular to light source 1023, etc.) that does not block light emitted from light source 1023. In other words, support wire 1061 does not cast a shadow on flame element 1001 from light emitted from light source 1023. In other words, support wire 1061 is most typically hidden behind a front of flame element 1001 define by a face 1067.

[0099] Flame element 1001 has a flame-shaped portion 1025 and a body portion 1027 as shown in **Figure 10C**. Flame-shaped portion 1025 has face 1067, which is typically the

major surface area of flame-shaped portion 1025. Aperture 1065 is disposed in body portion 1027, and more specifically in an elongated portion 1071 of body portion 1027. However, it is contemplated that aperture 1065 can be disposed on base portion 1073 of body portion 1027 or on flame-shaped portion 1025. In contemplated embodiments, aperture 1065 extends through body portion 1027 in a direction parallel to face 1067. In other words, aperture 1065 extends in a line that is parallel to the plane of face 1067.

[00100] It is contemplated that flame element 1001 can have flame-shaped portion 1025 with a first weight and body portion 1027 with a second weight, such that the second weight is greater than the first weight. Typically, the center of mass of flame element 1001 is below aperture 1065, which ensures that flame element 1001 remains upright when it is supported in housing 1005. Additionally, or alternatively, body portion 1027 comprises elongated portion 1071 and base portion 1073, and elongated portion 1071 has a smaller cross-sectional area than base portion 1073. **Figure 10D** shows that aperture 1065 can be a through hole disposed on body portion 1027.

[00101] As discussed above, various different configurations are contemplated for electronic lighting devices. One of the various contemplated configurations comprises an electronic lighting device 1100 having an arm 1115 that is removably coupled to housing 1105 as shown in **Figures 11A and 11B**. In Figs. 11A and 11B, arm 1115 can be slid into a recessed portion 1171 to couple arm 1115 to housing 1105. While a sliding configuration is disclosed, it should be appreciated that other contemplated coupling techniques include a snap-fit, pressure-fit, lock-fit, rotational lock-fitting, rotational snap-fitting, using fasteners such as screws, nuts, bolts, and/or washers.

[00102] Fig. 11A shows a top view of housing 1105 having arm 1115 coupled, which allows a user to couple a flame element to arm 1115 via top opening 1169. However, it is also contemplated that flame element can be coupled to arm 1115, and then arm 1115 with flame element can be subsequently coupled to housing 1105. Fig. 11B shows arm 1115 removed from housing 1105. Recessed portion 1171 can extend into housing to create a slot that fits a portion of arm 1115. It is contemplated that arm 1115 can be removed by sliding arm 1115 out of recessed portion 1171 in housing 1105. It should be noted that arm 1115 that is removably coupled to housing 1105 can be implemented in the other embodiments described above.

[00103] As used in the description herein and throughout the claims that follow, the meaning of “a,” “an,” and “the” includes plural reference unless the context clearly dictates otherwise. Also, as used in the description herein, the meaning of “in” includes “in” and “on” unless the context clearly dictates otherwise.

[00104] Also, as used herein, and unless the context dictates otherwise, the term "coupled to" is intended to include both direct coupling (in which two elements that are coupled to each other contact each other) and indirect coupling (in which at least one additional element is located between the two elements). Therefore, the terms "coupled to" and "coupled with" are used synonymously.

[00105] In some embodiments, the numbers expressing quantities of ingredients, properties such as concentration, reaction conditions, and so forth, used to describe and claim certain embodiments of the invention are to be understood as being modified in some instances by the term “about.” Accordingly, in some embodiments, the numerical parameters set forth in the written description and attached claims are approximations that can vary depending upon the desired properties sought to be obtained by a particular embodiment. In some embodiments, the numerical parameters should be construed in light of the number of reported significant digits and by applying ordinary rounding techniques. Notwithstanding that the numerical ranges and parameters setting forth the broad scope of some embodiments of the invention are approximations, the numerical values set forth in the specific examples are reported as precisely as practicable. The numerical values presented in some embodiments of the invention may contain certain errors necessarily resulting from the standard deviation found in their respective testing measurements. Moreover, and unless the context dictates the contrary, all ranges set forth herein should be interpreted as being inclusive of their endpoints and open-ended ranges should be interpreted to include only commercially practical values. Similarly, all lists of values should be considered as inclusive of intermediate values unless the context indicates the contrary.

[00106] Thus, it should be apparent, however, to those skilled in the art that many more modifications besides those already described are possible without departing from the inventive concepts herein. The scope of the claims should not be limited by the preferred embodiments set forth in the examples, but should be given the broadest interpretation consistent with the description as a whole. Moreover, in interpreting the disclosure all terms should be interpreted in the broadest possible manner consistent with the context. In particular the terms “comprises” and “comprising” should be interpreted as referring to the elements,

components, or steps in a non-exclusive manner, indicating that the referenced elements, components, or steps can be present, or utilized, or combined with other elements, components, or steps that are not expressly referenced.

CLAIMS

What is claimed is:

1. An electronic lighting device, comprising:
 - a flame element comprising a hollow interior and an aperture disposed on a sidewall of the flame element, wherein the flame element comprises a tab that extends from the sidewall of the flame element into the aperture;
 - a housing comprising an internal cavity;
 - an arm that extends horizontally from the housing and has a first end disposed in a central area of the internal cavity, wherein the arm comprises a projection;
 - wherein the arm is sized and dimensioned to extend into the aperture to suspend the flame element within the internal cavity and to allow the flame element to move with respect to the arm; and
 - wherein the tab and the projection of the arm overlap to secure the flame element on the arm.
2. The electronic lighting device of claim 1, further comprising a pin that is sized and dimensioned to extend through a second aperture and into the hollow interior to secure the flame element on the arm.
3. The electronic lighting device of claim 1, wherein the first end of the arm has a recess disposed in the hollow interior of the flame element when the arm is inserted into the flame element, and the flame element has a projection that extends downward into the hollow interior, and further wherein the projection of the flame element rests on the recess to allow the flame element to move while the projection of the flame element rests on the recess.
4. The electronic lighting device of claim 3, further comprising a pin having a recess, wherein the projection of the arm extends downward to thereby rest within the recess of the pin.
5. The electronic lighting device of claim 1, further comprising a light source disposed within the housing and configured to emit light onto a face of the flame element, and wherein the light source is disposed facing the flame element, and the arm is disposed facing a back of the flame element opposite the face.

6. The electronic lighting device of claim 1, wherein the projection of the arm extends downward.
7. The electronic lighting device of claim 1, wherein a concave apex defines an upper portion of the hollow interior.
8. The electronic lighting device of claim 7, wherein the arm has an upward projection and the concave apex rests on the upward projection so as to allow movement of the flame element while the flame element is suspended on the arm.
9. The electronic lighting device of claim 8, wherein the tab is defined by the sidewall and forms part of the aperture, and wherein the projection of the arm extends downward, and wherein the tab and the downward projection of the arm overlap to secure the flame element on the arm while the concave apex rests on the upward projection.
10. An electronic lighting device, comprising:
 - a flame element comprising a first aperture disposed on a sidewall of the flame element and a second aperture on a bottom surface of the flame element, wherein the flame element further comprises a hollow interior that extends from the first aperture to the second aperture;
 - a housing comprising an internal cavity;
 - an arm that extends horizontally from the housing and ends within a central area of the internal cavity; and
 - wherein the arm is sized and dimensioned to extend horizontally through the first aperture and not the second aperture to suspend the flame element within the internal cavity to allow the flame element to move with respect to the arm.
11. The electronic lighting device of claim 10, further comprising a pin that is sized and dimensioned to extend upwardly through the second aperture and into the hollow interior of the flame element to inhibit removal of an end of the arm from the flame element.
12. The electronic lighting device of claim 10, wherein the arm has a recess, and the flame element has a projection that extends downward, and further wherein the projection rests on the recess to allow the flame element to move while the flame element is suspended on the arm.

13. The electronic lighting device of claim 12, wherein the flame element comprises a movable tab that extends from the sidewall into the first aperture, and wherein the tab and the downward projection of the arm overlap to inhibit removal of an end of the arm from the flame element while the flame element is suspended on the arm.
14. An electronic lighting device, comprising:
- a flame element comprising a hollow interior and an aperture disposed on a sidewall of the flame element, wherein the flame element has a projection that extends downward into the hollow interior, and wherein the flame element comprises a tab that is defined by the sidewall and forms part of the aperture;
 - a housing comprising an internal cavity;
 - an arm that extends horizontally from the housing through the aperture and terminates within the hollow interior;
 - wherein the arm has a recess and wherein the projection of the flame element rests within the recess to allow the flame element to move while the projection of the flame element rests within the recess; and
 - wherein the tab and a projection of the arm overlap to secure the flame element on the arm to secure the flame element on the arm.
15. The electronic lighting device of claim 14, wherein the arm is formed by a portion of the housing.
16. An electronic lighting device, comprising:
- a housing comprising an internal cavity;
 - a mounting bracket removably coupled to the housing and disposed within the internal cavity of the housing;
 - wherein the housing comprises an arm that extends horizontally from the housing and terminates within the internal cavity, wherein the arm is formed by a portion of the housing;
 - a flame element comprising a hollow interior and an aperture disposed on a sidewall of the flame element; and
 - wherein a portion of the arm extends through the aperture into the hollow interior of the flame element to suspend the flame element within the internal cavity of the housing and allow the flame element to move with respect to the arm.

17. The device of claim 16, wherein a first end of the arm has a recess disposed in the hollow interior of the flame element when the arm is inserted into the flame element, and the flame element has a projection that extends downward into the hollow interior, and wherein the projection rests in the recess to allow the flame element to move while the projection rests in the recess.
18. The device of claim 16, further comprising a light source disposed within the mounting bracket and configured to emit light onto a face of the flame element, and wherein the light source is disposed on one side of the flame element, and the arm is disposed on an opposite side of the flame element.
19. The device of claim 16, wherein the flame element comprises a flexible tab that extends from the sidewall of the flame element into the aperture.
20. The device of claim 19, wherein the arm has a downward projection, and wherein the tab and the downward projection of the arm overlap to secure the flame element on the arm while the flame element is suspended on the arm.
21. The device of claim 16, wherein the mounting bracket snap fits into the housing.
22. An electronic lighting device having a housing and a mounting bracket that removably couples to the housing, comprising:
 - a flame element at least partially disposed within the housing and having a flame-shaped portion and a body portion, wherein a clip is disposed on the flame element; and
 - a mounting rod that is sized and dimensioned to couple the flame element to the housing by engaging the clip so as to allow movement of the flame element with respect to the housing while the flame element is coupled to the housing.
23. The electronic lighting device of claim 22, wherein the clip comprises a wire clip that forms a through hole, and wherein the mounting rod is configured to engage the wire clip via the through hole.
24. The electronic lighting device of claim 23, wherein the wire clip is disposed on the flame-shaped portion of the flame element at one end, and wherein the mounting rod is

configured to engage the flame element via a friction fit provided between the wire clip and the flame element.

25. The electronic lighting device of claim 23, wherein the mounting bracket comprises a slot, and further wherein the mounting rod engages the slot of the mounting bracket to couple the flame element to the housing.
26. The electronic lighting device of claim 22, wherein the clip comprises an arch disposed on the flame element, and wherein the mounting rod is configured to couple the arch.
27. The electronic lighting device of claim 26, wherein the arch is formed by a portion of the flame element.
28. The electronic lighting device of claim 26, wherein the mounting bracket comprises a slot, and further wherein the mounting rod engages the slot of the mounting bracket to couple the flame element to the housing.
29. The electronic lighting device of claim 22, further comprising a notch disposed in the body portion, wherein the clip is adjacent to the flame-shaped portion and extends into the notch.
30. The electronic lighting device of claim 29, wherein the mounting bracket comprises a slot, and further wherein the mounting rod engages the slot of the mounting bracket to couple the flame element to the housing.
31. The electronic lighting device of claim 22, wherein the clip is disposed on an exterior surface of the flame element.
32. An electronic lighting device, comprising:
 - a flame element having a flame-shaped portion and a body portion, wherein the flame-shaped portion has a face that extends from a left side of the flame element to a right side of the flame element;
 - an aperture that extends through the body portion from the left side of the flame element to the right side of the flame element; and
 - a mounting bracket configured to receive a support wire, wherein the support wire extends inwardly through the aperture to support the flame element.

33. The electronic lighting device of claim 32, wherein the flame-shaped portion has a first weight and the body portion has a second weight, and wherein the second weight is greater than the first weight.
34. The electronic lighting device of claim 33, wherein a center of mass of the flame element is below the aperture, such that the flame element remains upright.
35. The electronic lighting device of claim 32, wherein the mounting bracket further comprises a slit that is sized and dimensioned to receive the support wire.
36. The electronic lighting device of claim 35, wherein the slit extends vertically into the mounting bracket.
37. The electronic lighting device of claim 32, wherein the body portion comprises an elongated portion and a base portion, and wherein the elongated portion has a cross-sectional area that is smaller than a cross-sectional area of the base portion.
38. The electronic lighting device of claim 32, further comprising a housing that is removably coupled to the mounting bracket, wherein the mounting bracket has a top opening.
39. The electronic lighting device of claim 38, wherein the support wire is positioned below the top opening.
40. The electronic lighting device of claim 32, further comprising a light source that rests within a groove on the mounting bracket.
41. An electronic lighting device, comprising:
- a flame element;
 - a mounting bracket;
 - a housing comprising an internal cavity and an arm that extends from the housing, wherein the housing is manufactured as a single piece, and wherein the arm is formed by a portion of the housing;
 - wherein the flame element is suspended in the housing by the arm; and
 - wherein the housing is sized and dimensioned to receive the mounting bracket in the internal cavity, such that the mounting bracket snap fits into the housing.

42. The electronic lighting device of claim 41, wherein the flame element comprises a protrusion disposed within a hollow interior of the flame element, such that the protrusion rests within a recess on the arm to suspend the flame element in the housing.
43. The electronic lighting device of claim 41, wherein the flame element has a hollow interior and comprises a concave apex that defines a top portion of the hollow interior, such that the concave apex rests on an upward protrusion of the arm to suspend the flame element in the housing.
44. The electronic lighting device of claim 41, further comprising a light source that rests within a groove of the mounting bracket, such that light is emitted from the light source onto the flame element.
45. An electronic lighting device, comprising:
a mounting bracket having a slit that extends vertically into the mounting bracket;
a housing having an internal cavity, wherein the housing is manufactured as a single piece;
a flame element that is suspended in the housing by a support wire that extends from the slit in the mounting bracket; and
wherein the housing is sized and dimensioned to receive the mounting bracket in the internal cavity.
46. The electronic lighting device of claim 45, wherein the flame element comprises an aperture, and wherein the support wire extends through the aperture to suspend the flame element in the housing.
47. The electronic lighting device of claim 46, wherein the flame element has a flame-shaped portion and a body portion, and wherein the aperture extends through the body portion.
48. The electronic lighting device of claim 45, wherein the housing has a bottom surface that overlaps the slit when the housing receives the mounting bracket, such that the support wire is at least partly secured in the slit by the housing.
49. The electronic lighting device of claims 1, 10, or 14, wherein the arm is removably coupled to the housing.

50. The electronic lighting device of claims 1, 10, or 14, wherein the housing further comprises a recessed portion that is sized and dimensioned to receive the arm.

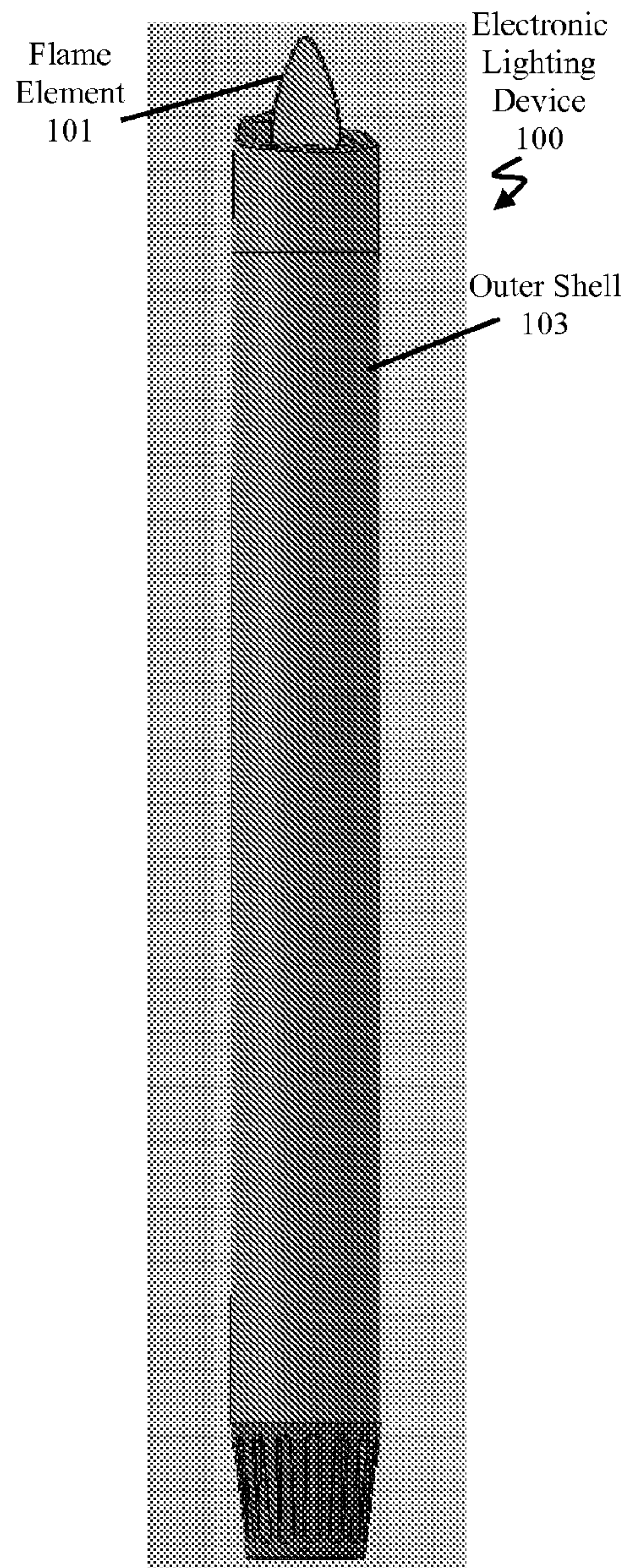


Figure 1A

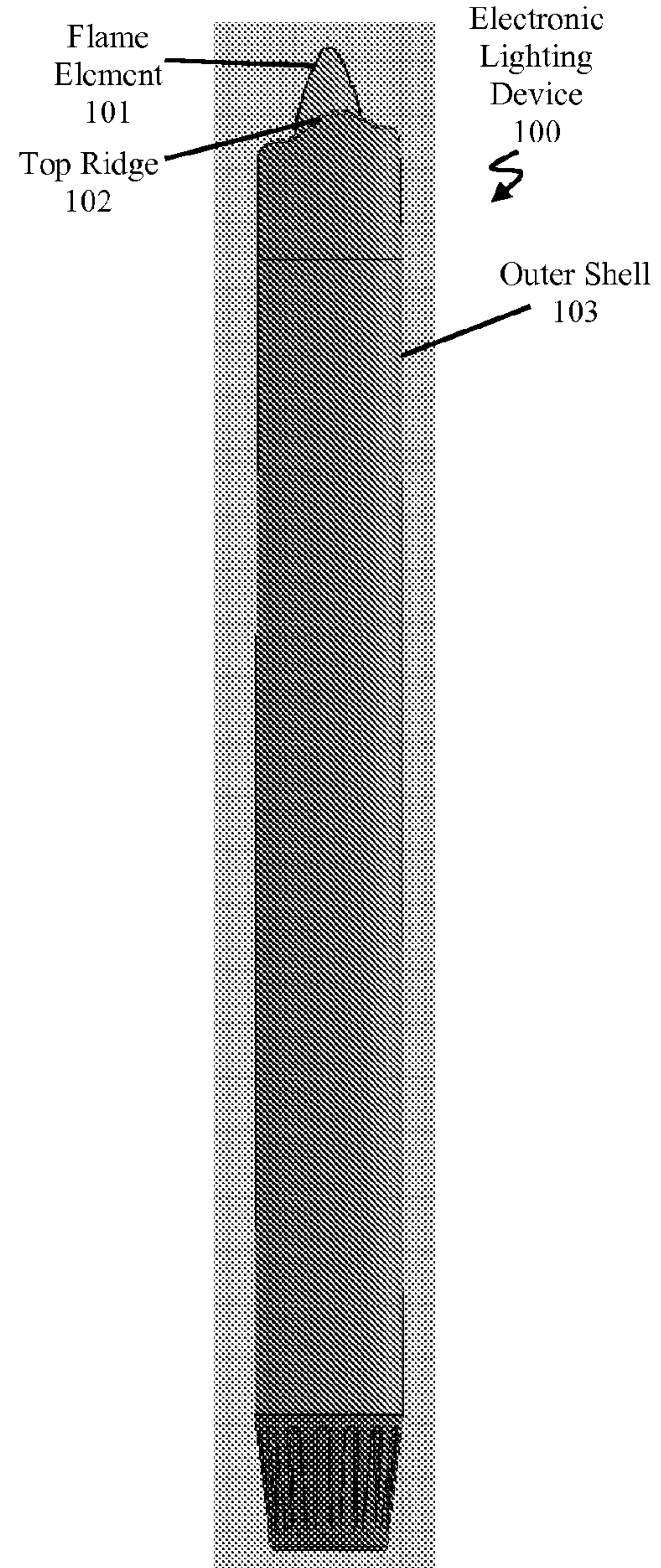


Figure 1B

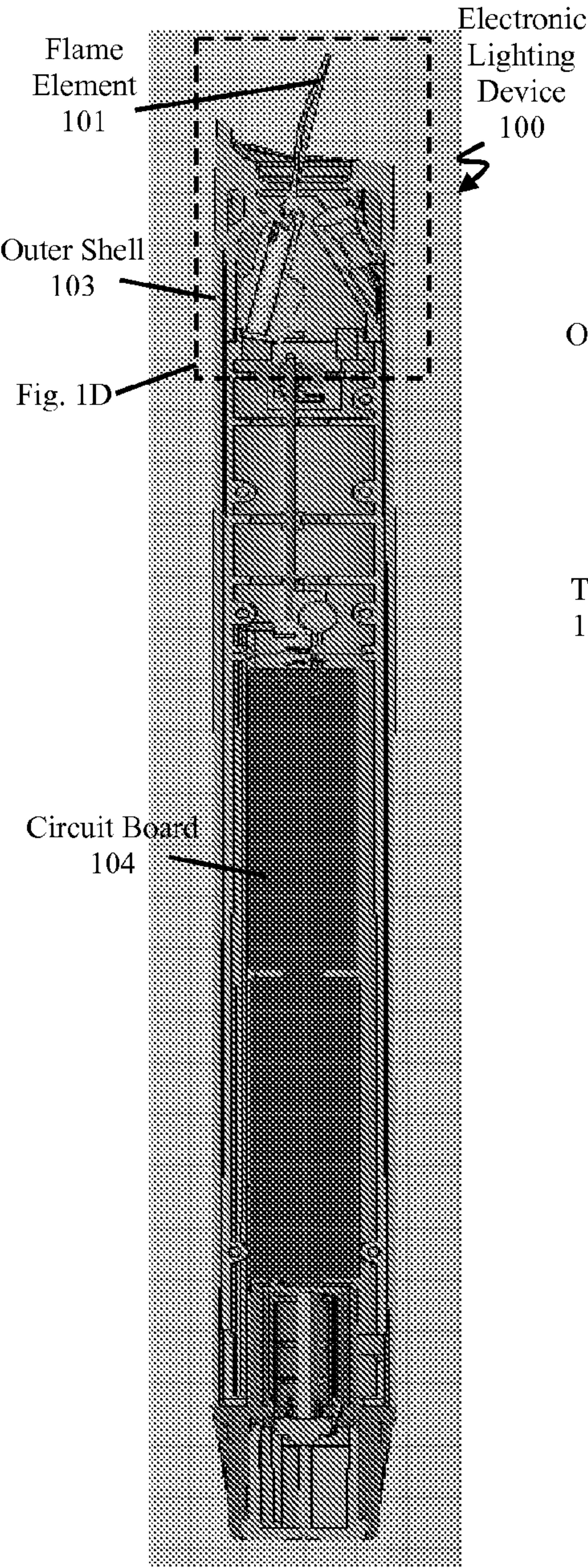


Figure 1C

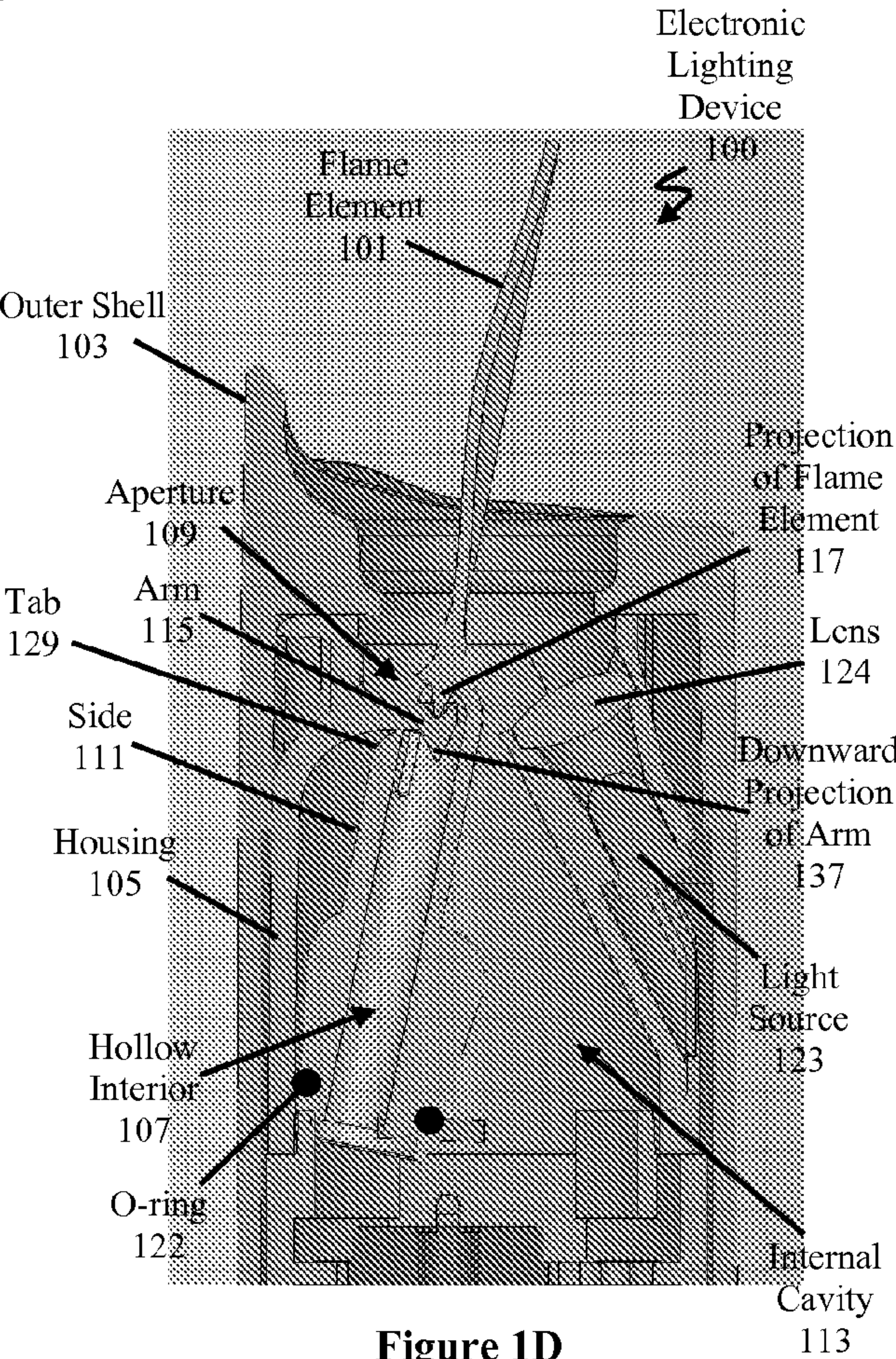


Figure 1D

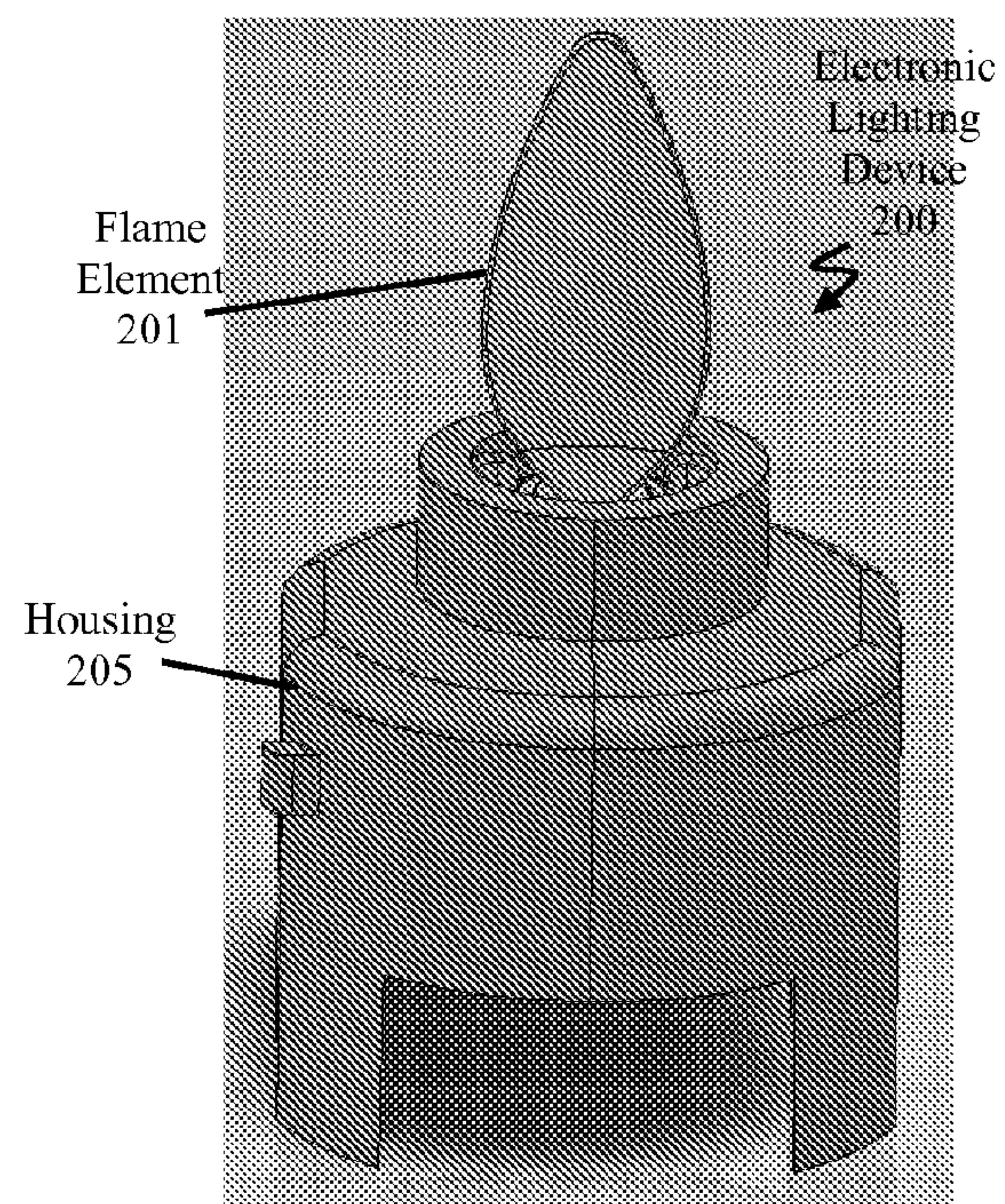


Figure 2A

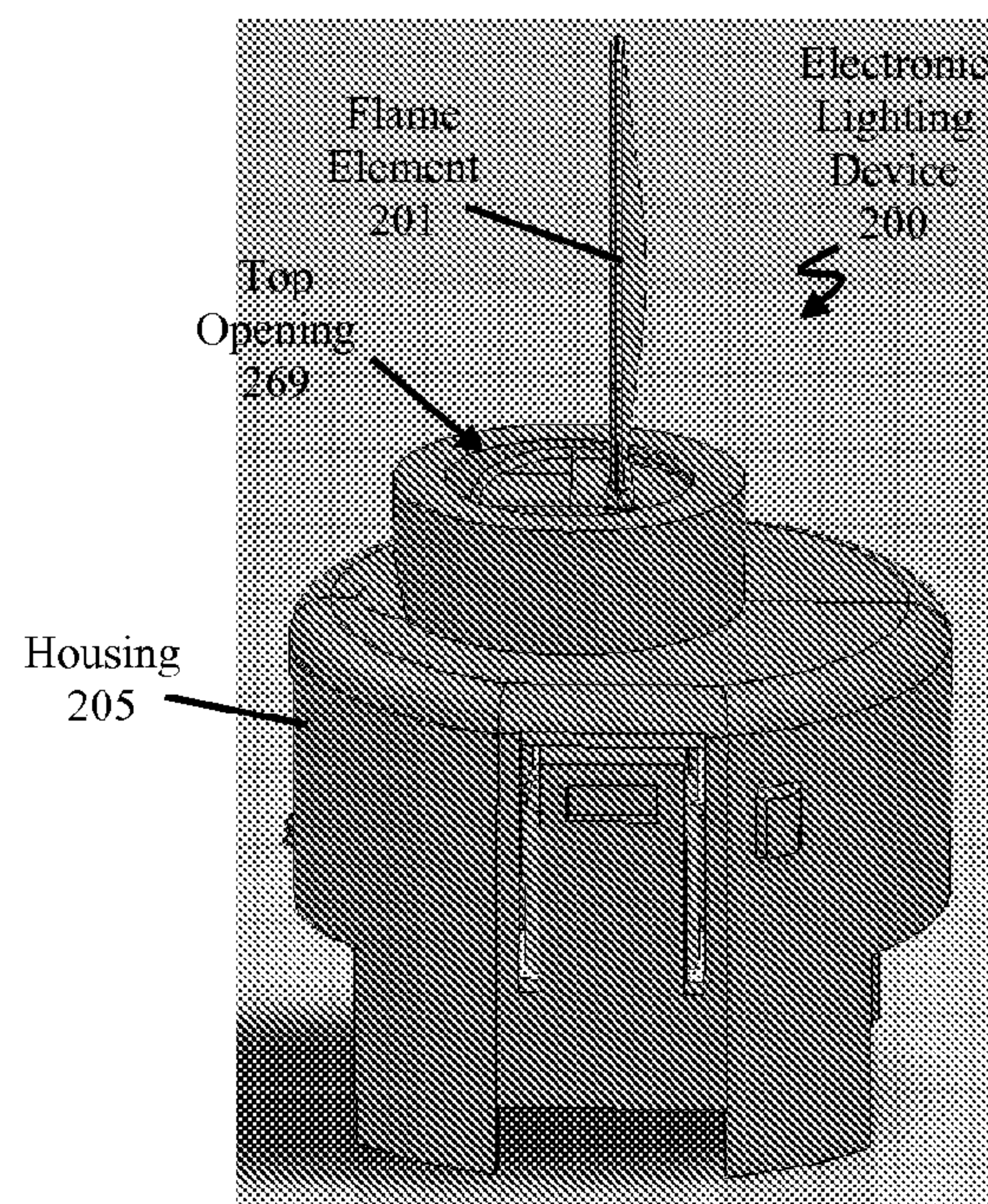
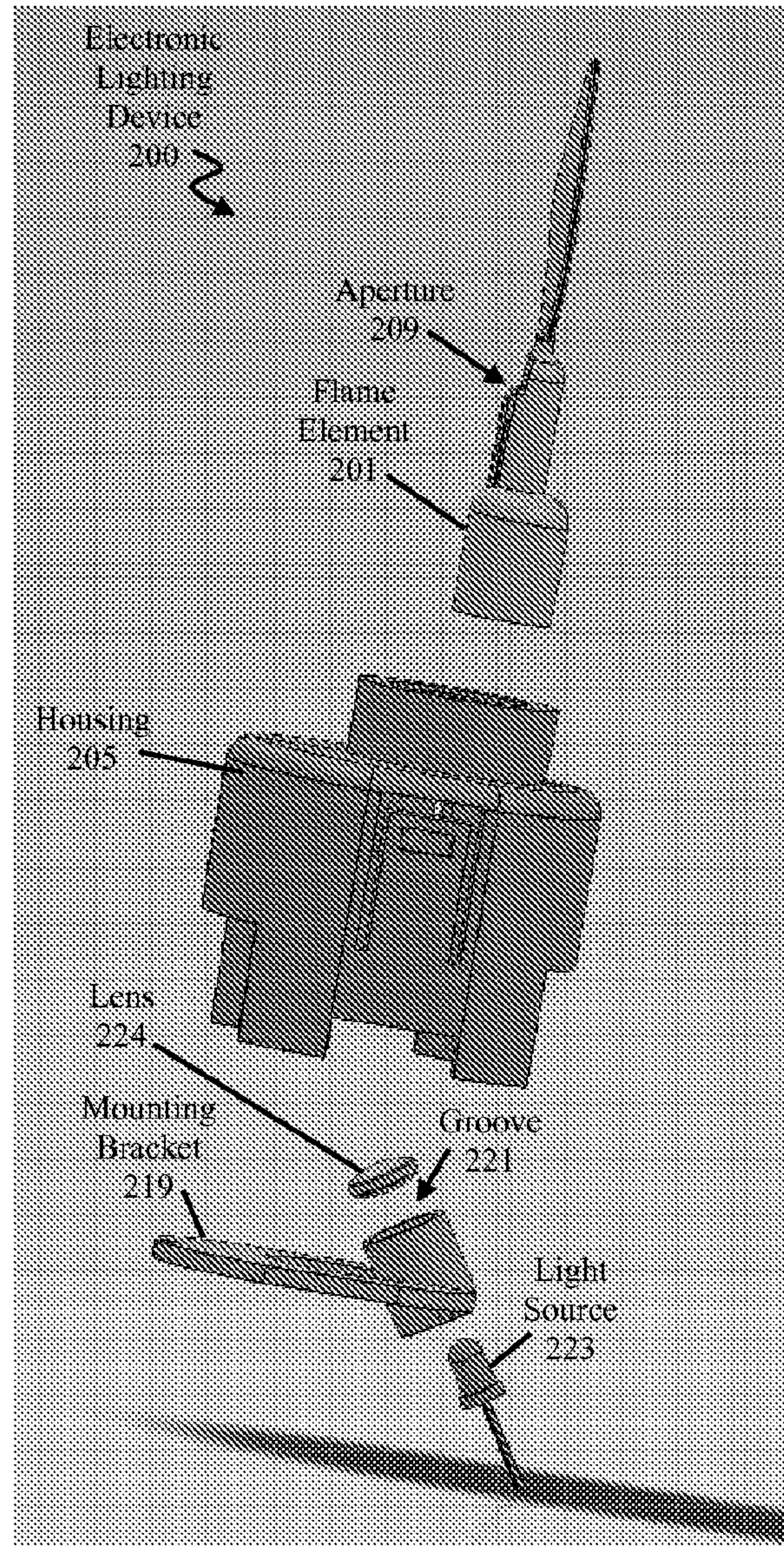


Figure 2B

**Figure 2C**

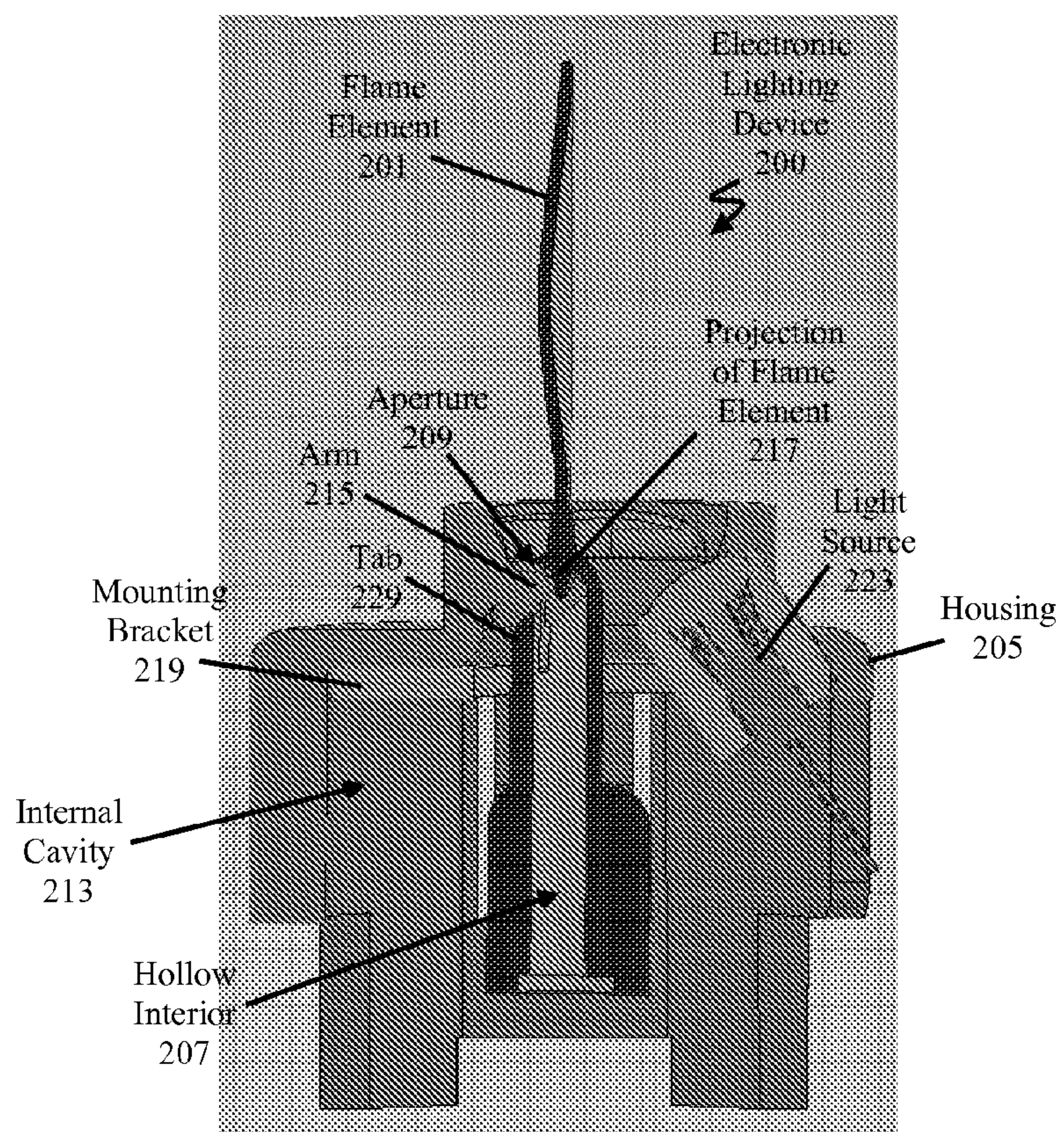
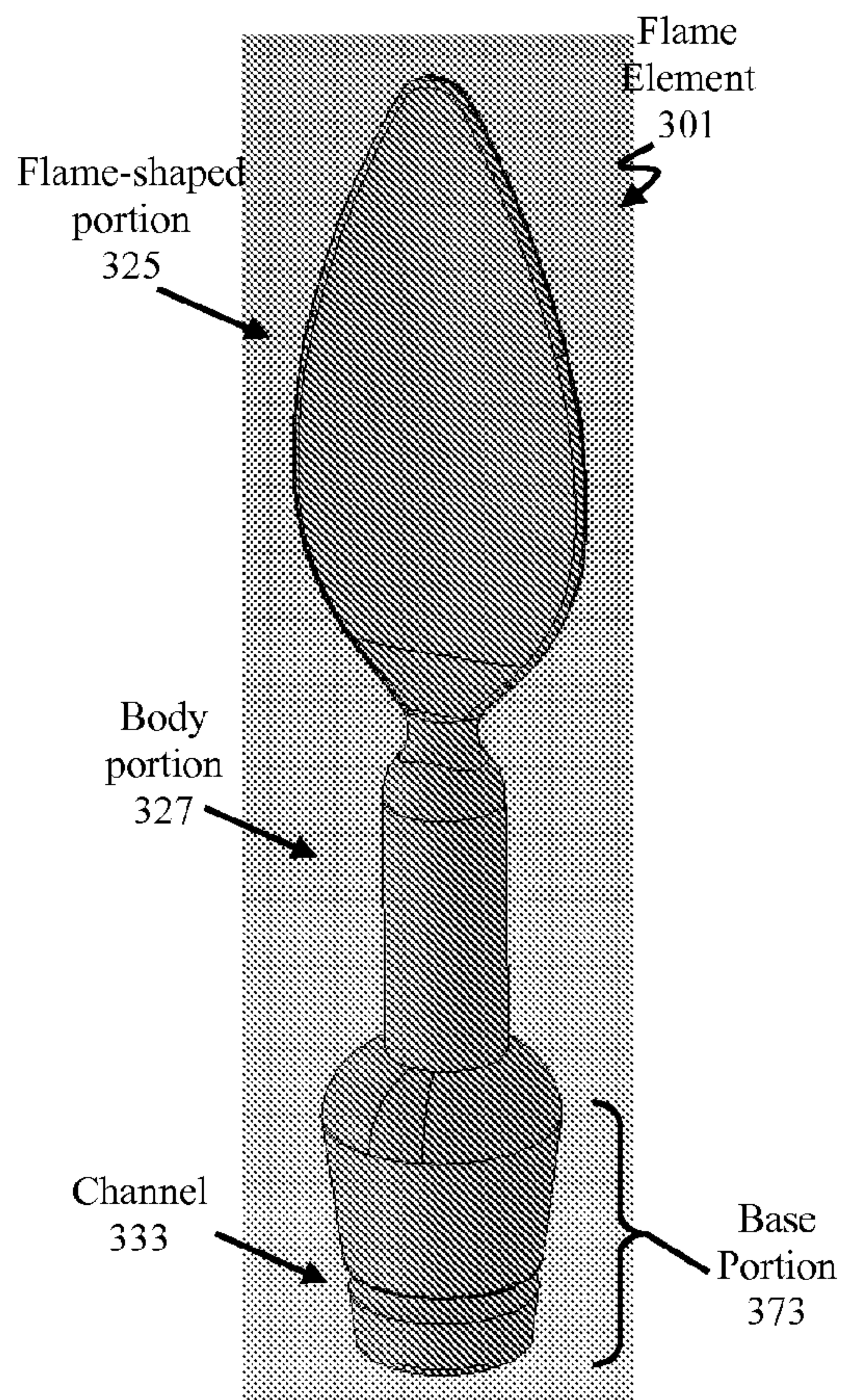
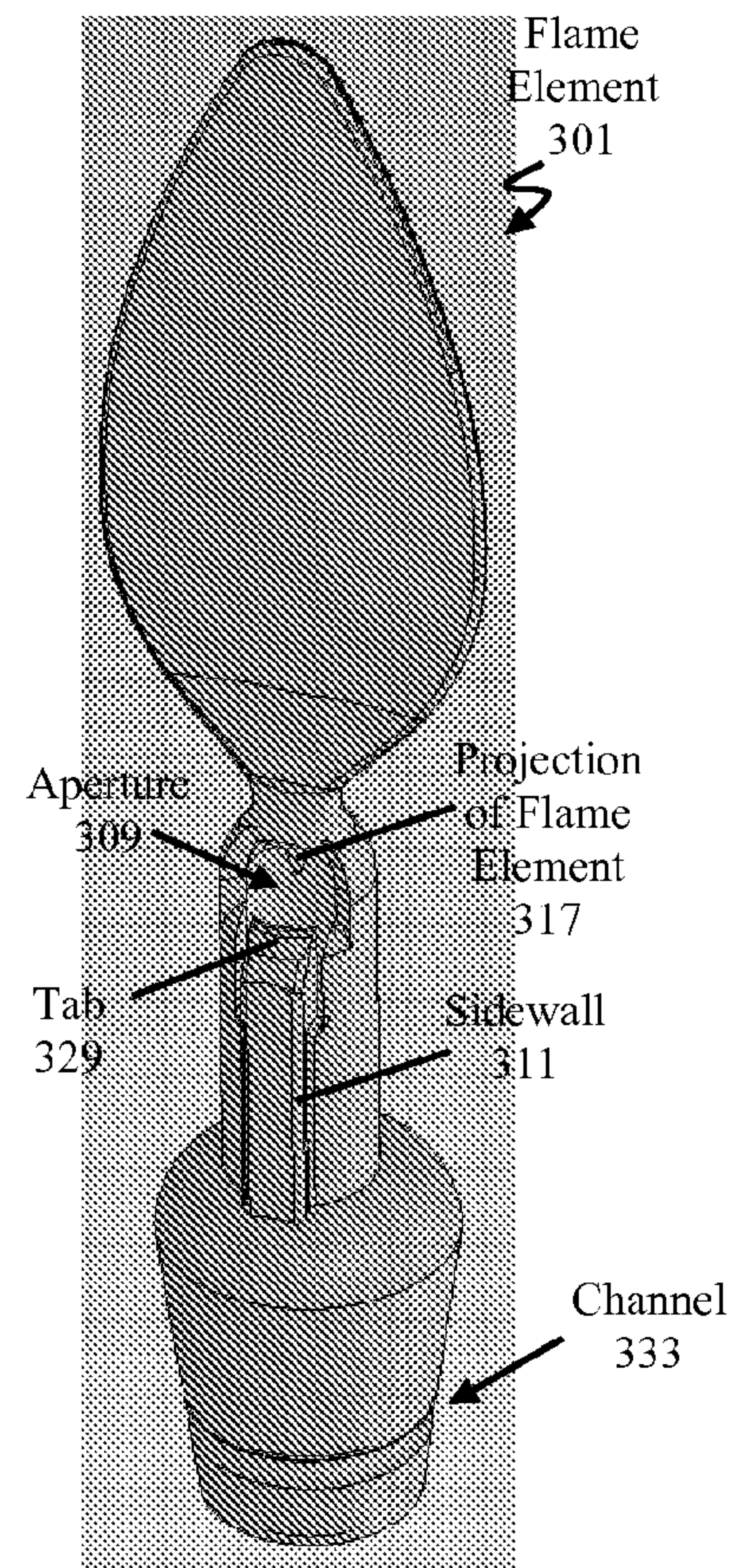


Figure 2D

**Figure 3A****Figure 3B**

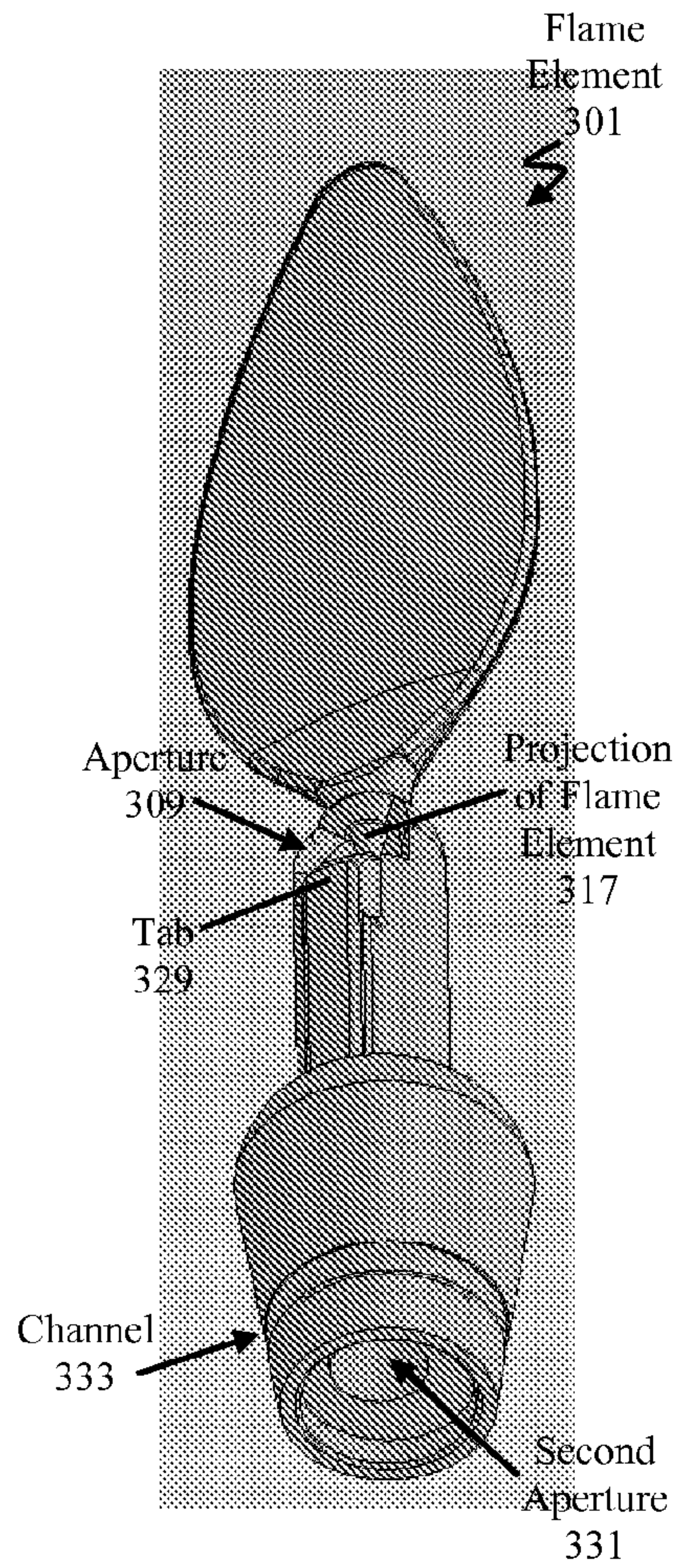


Figure 3C

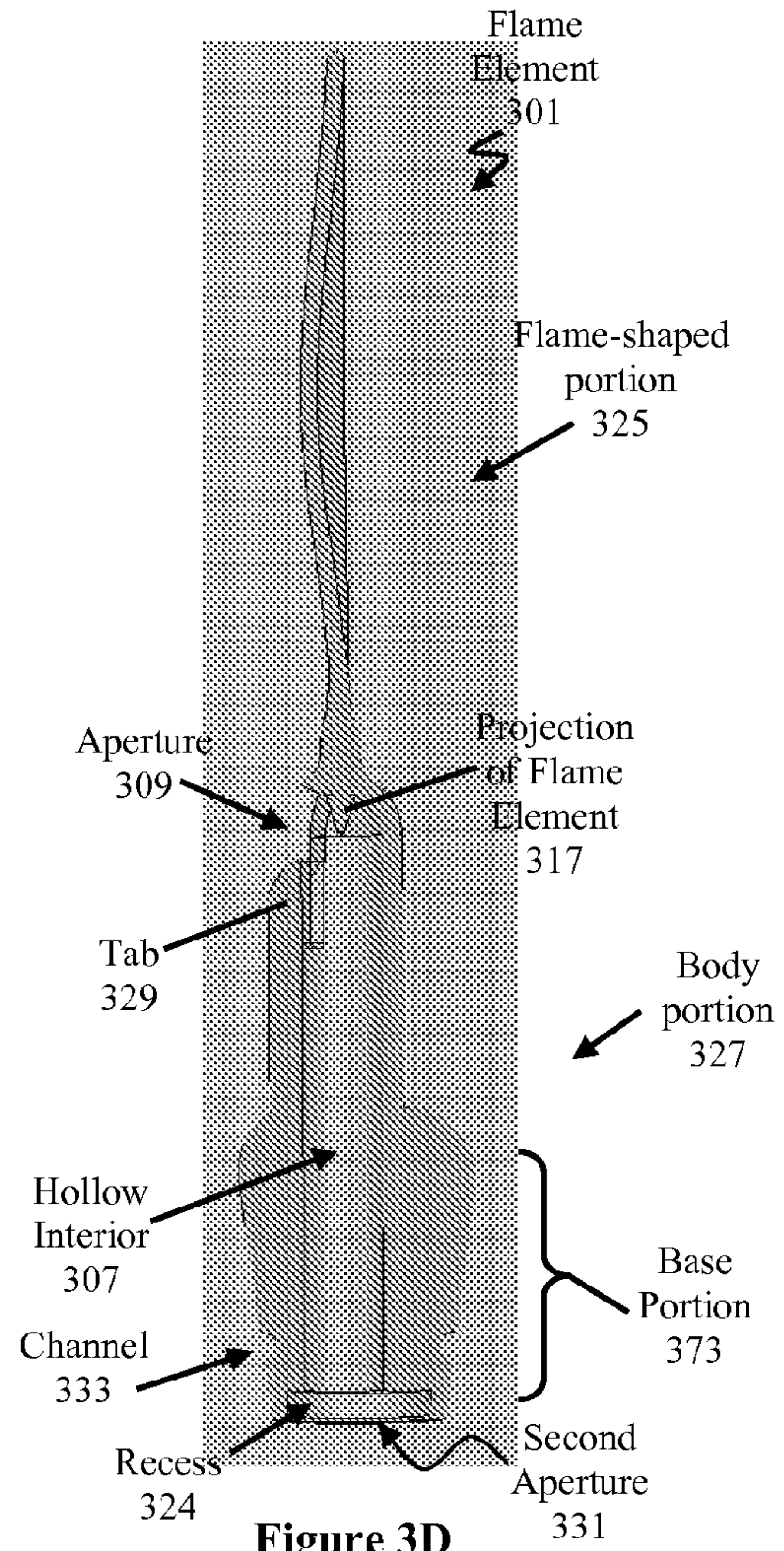


Figure 3D

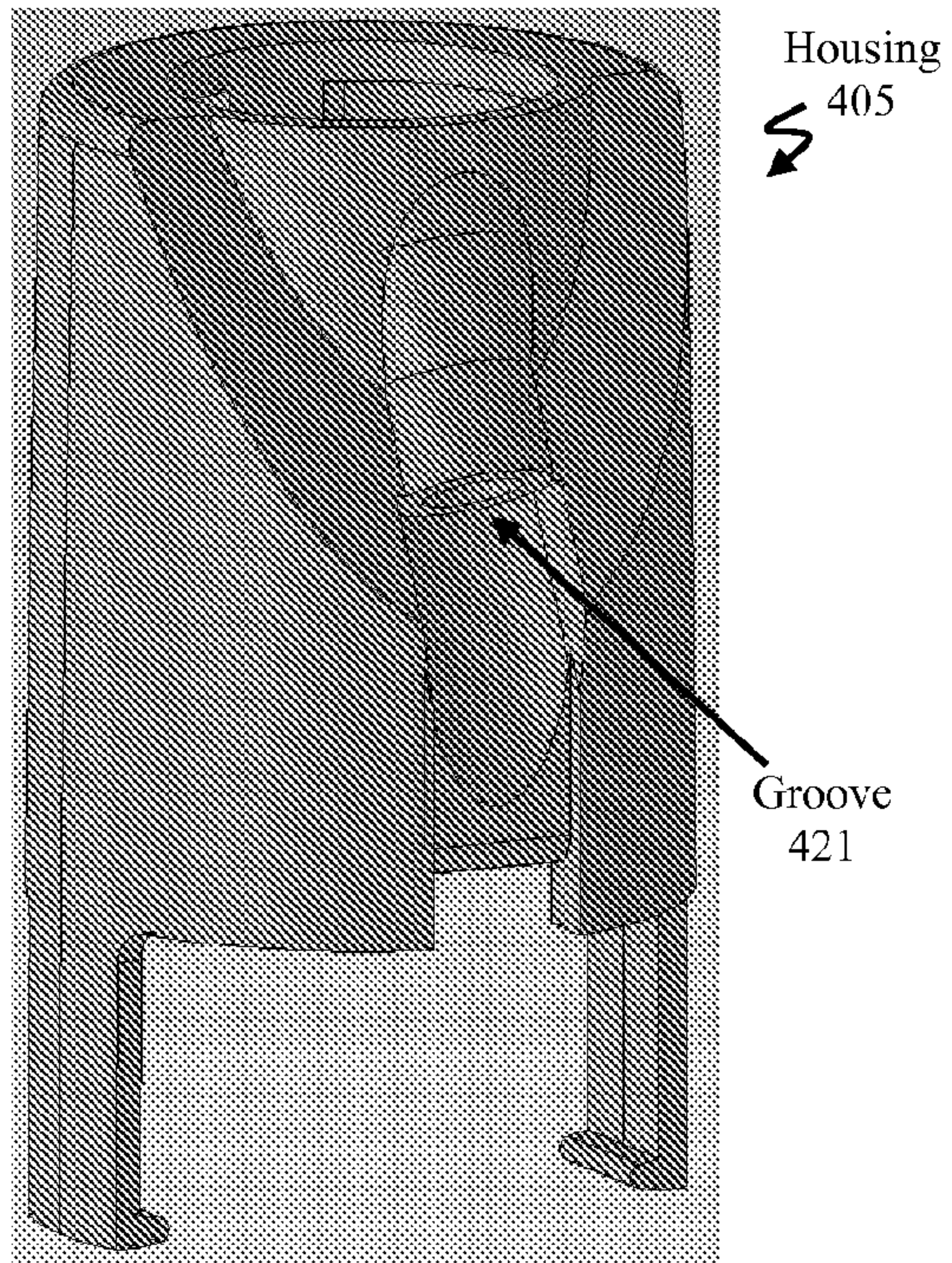


Figure 4A

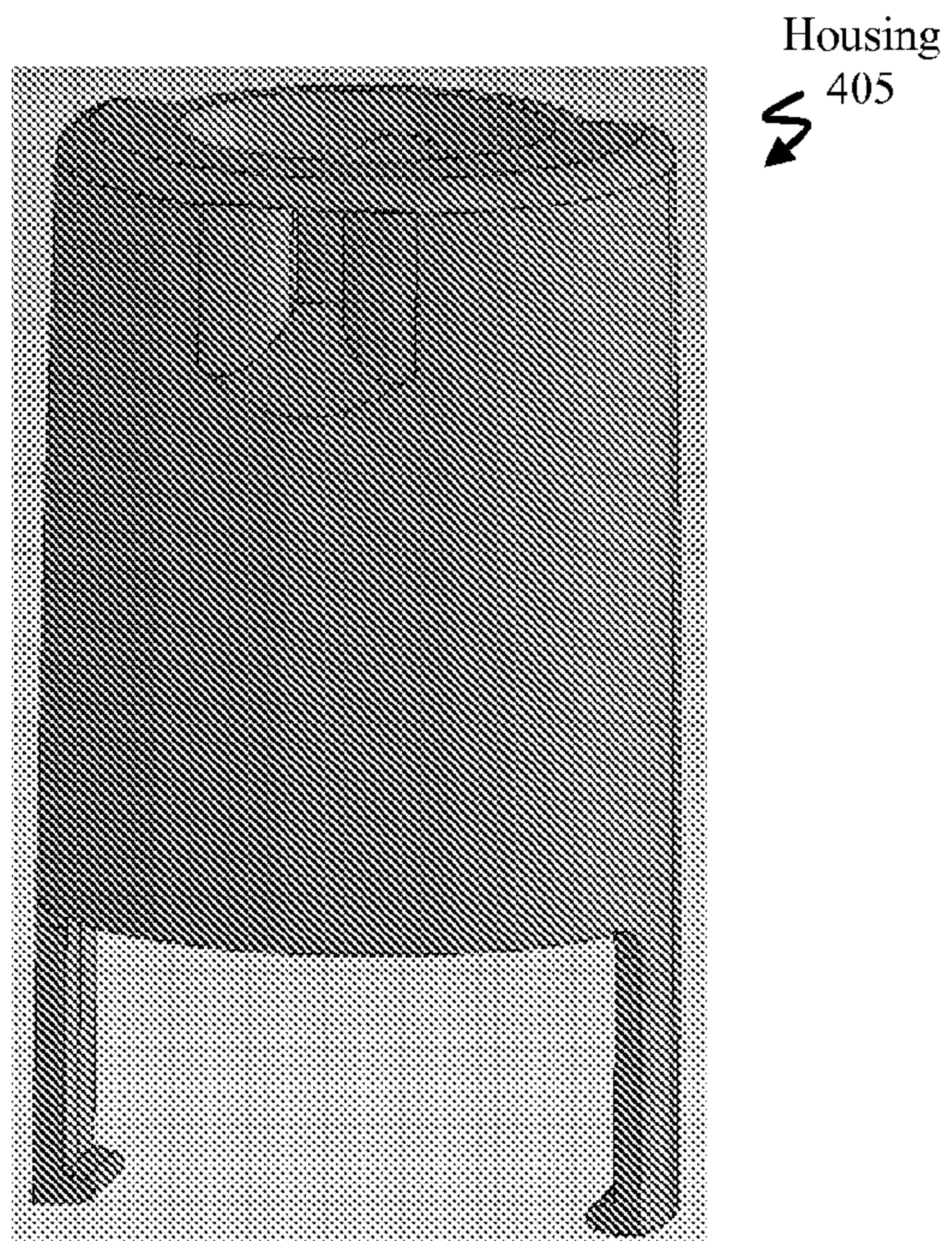
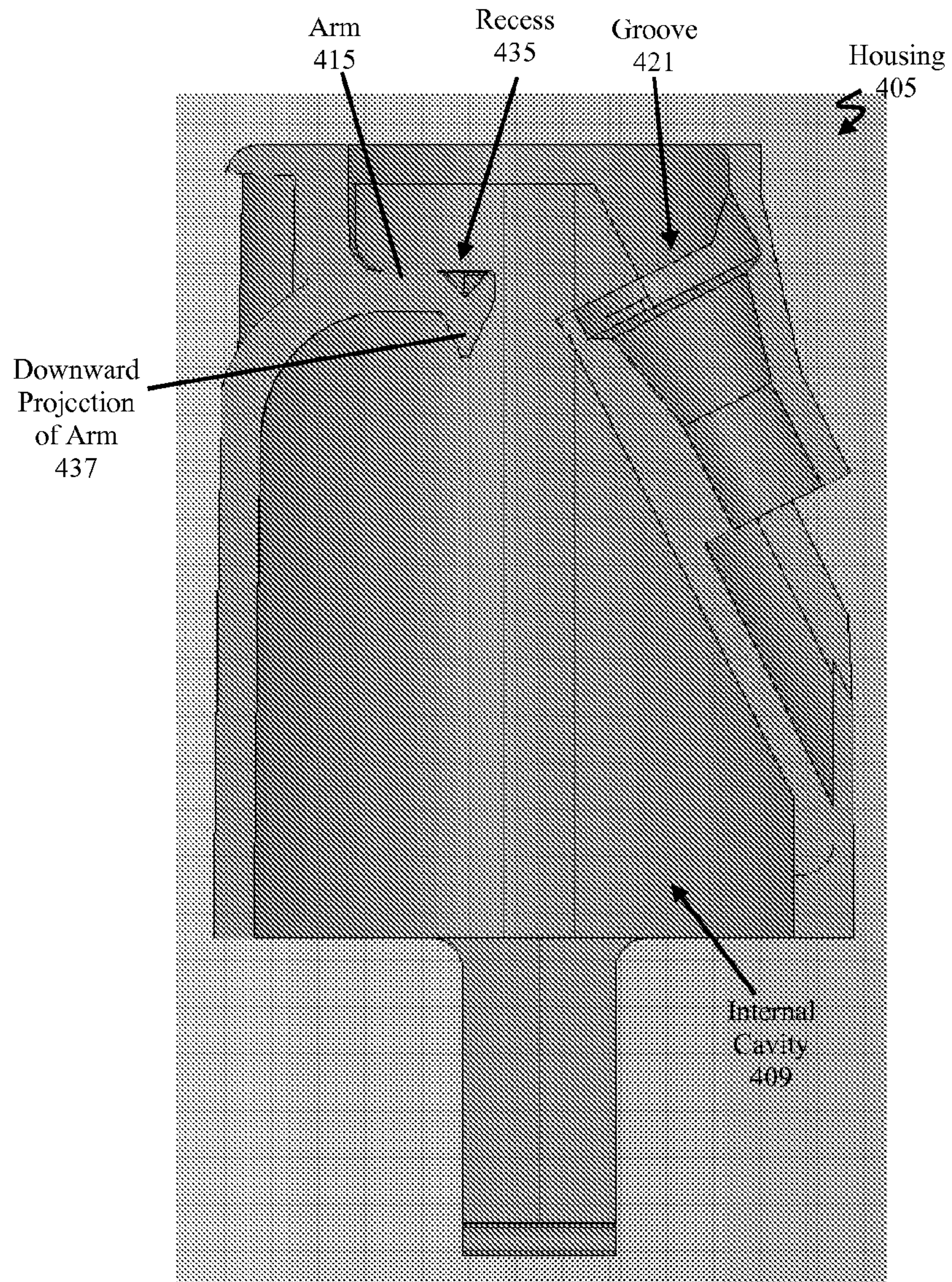


Figure 4B

**Figure 4C**

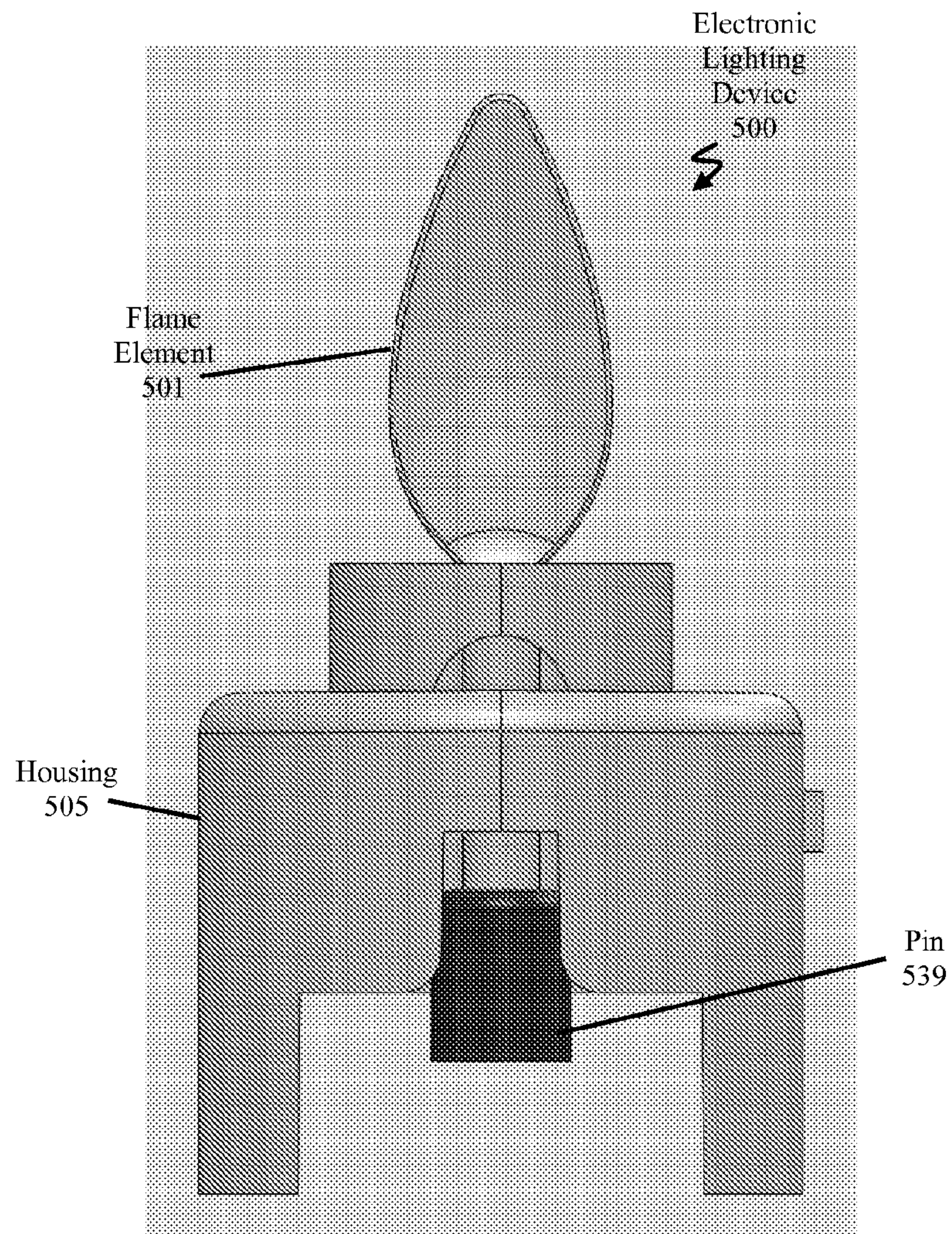


Figure 5A



Figure 5B

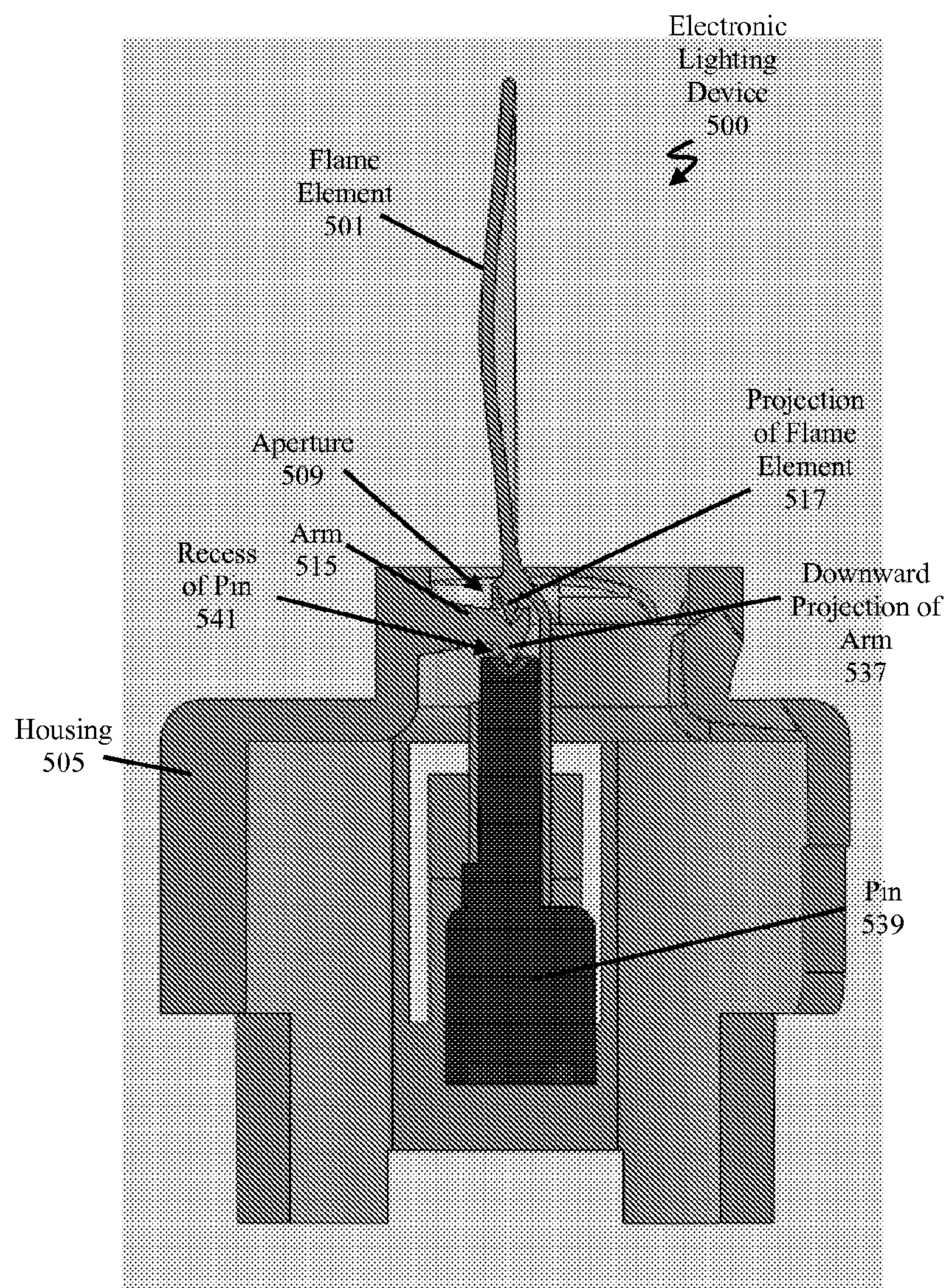
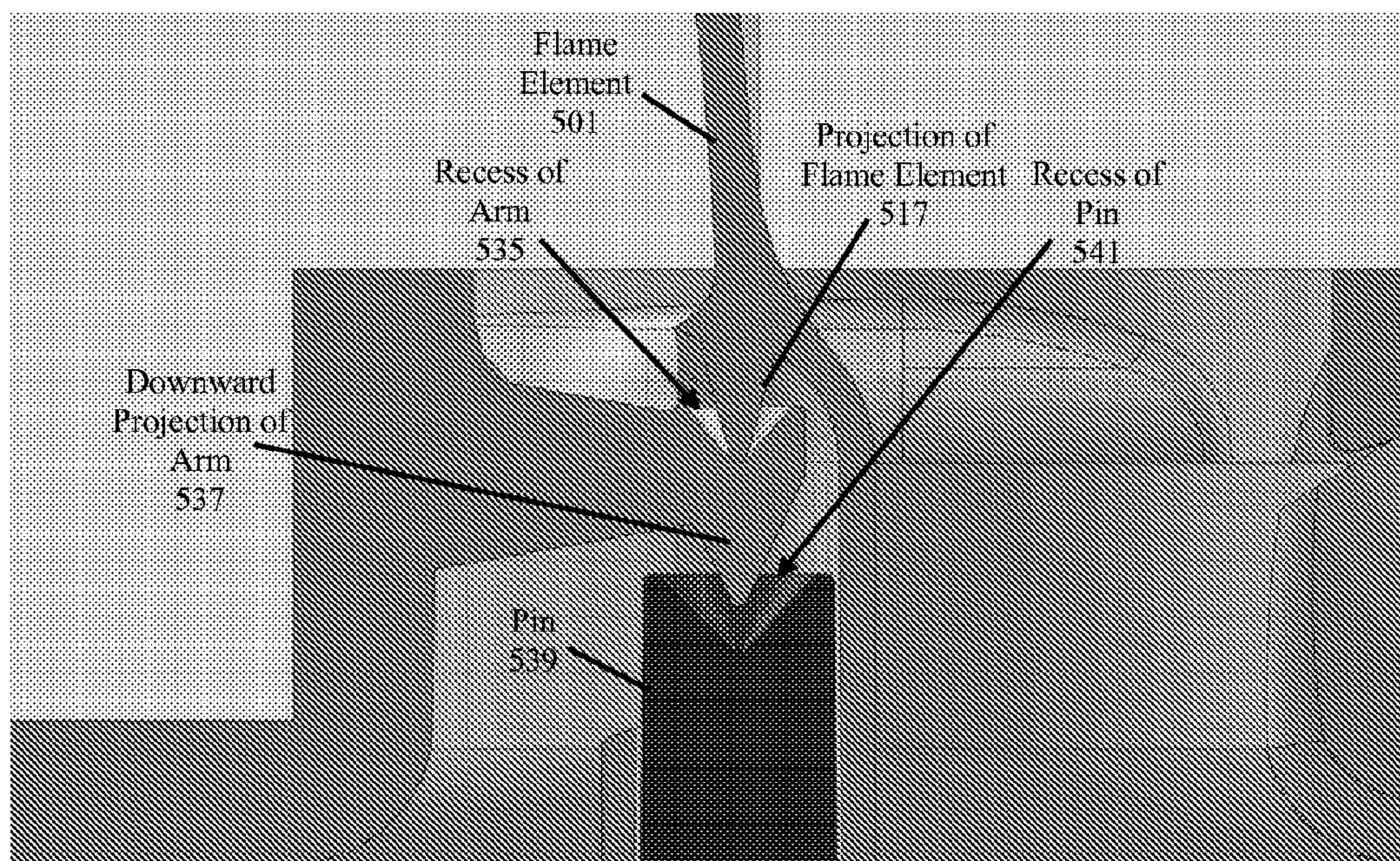


Figure 5C

**Figure 5D**

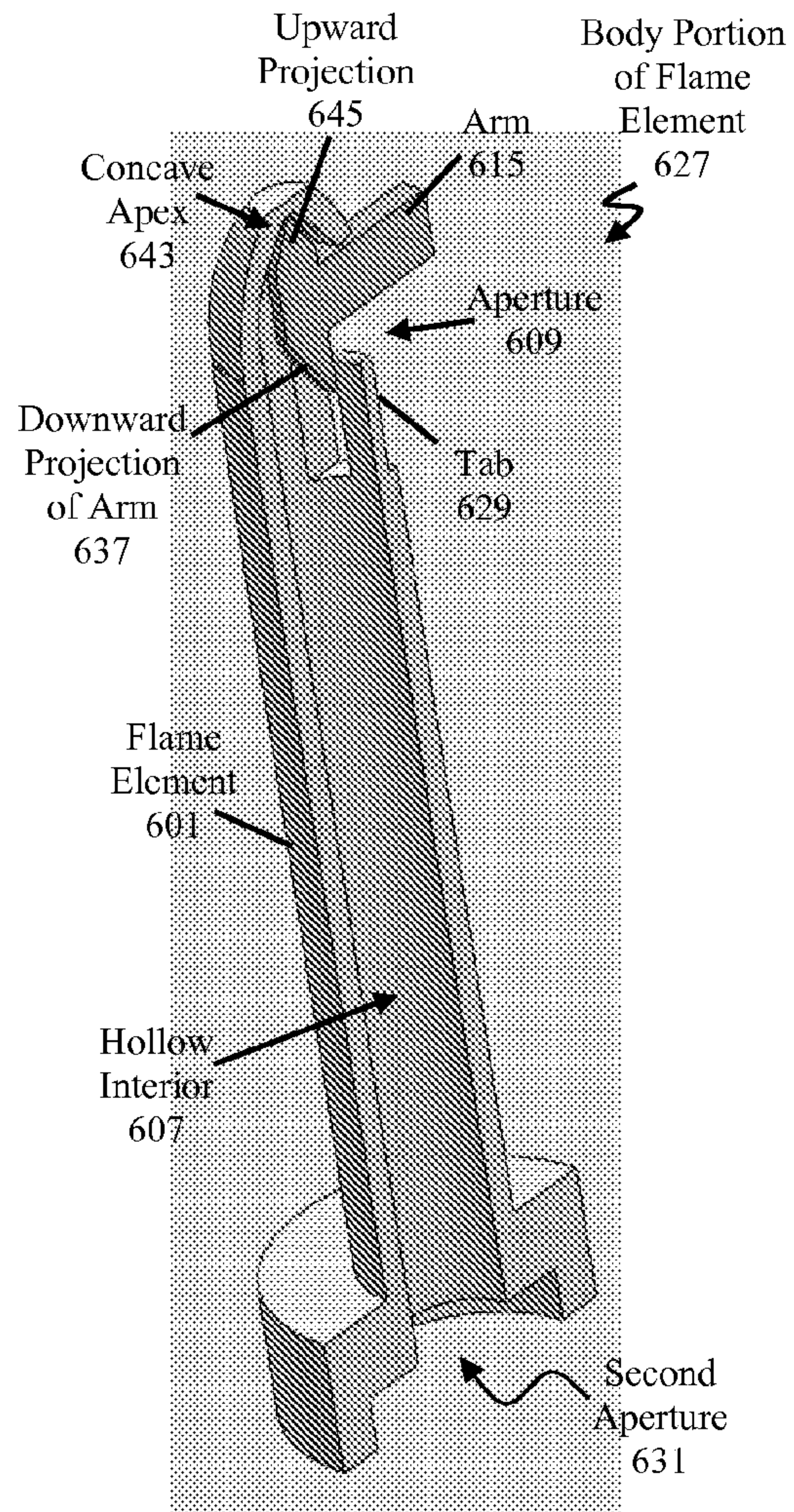


Figure 6A

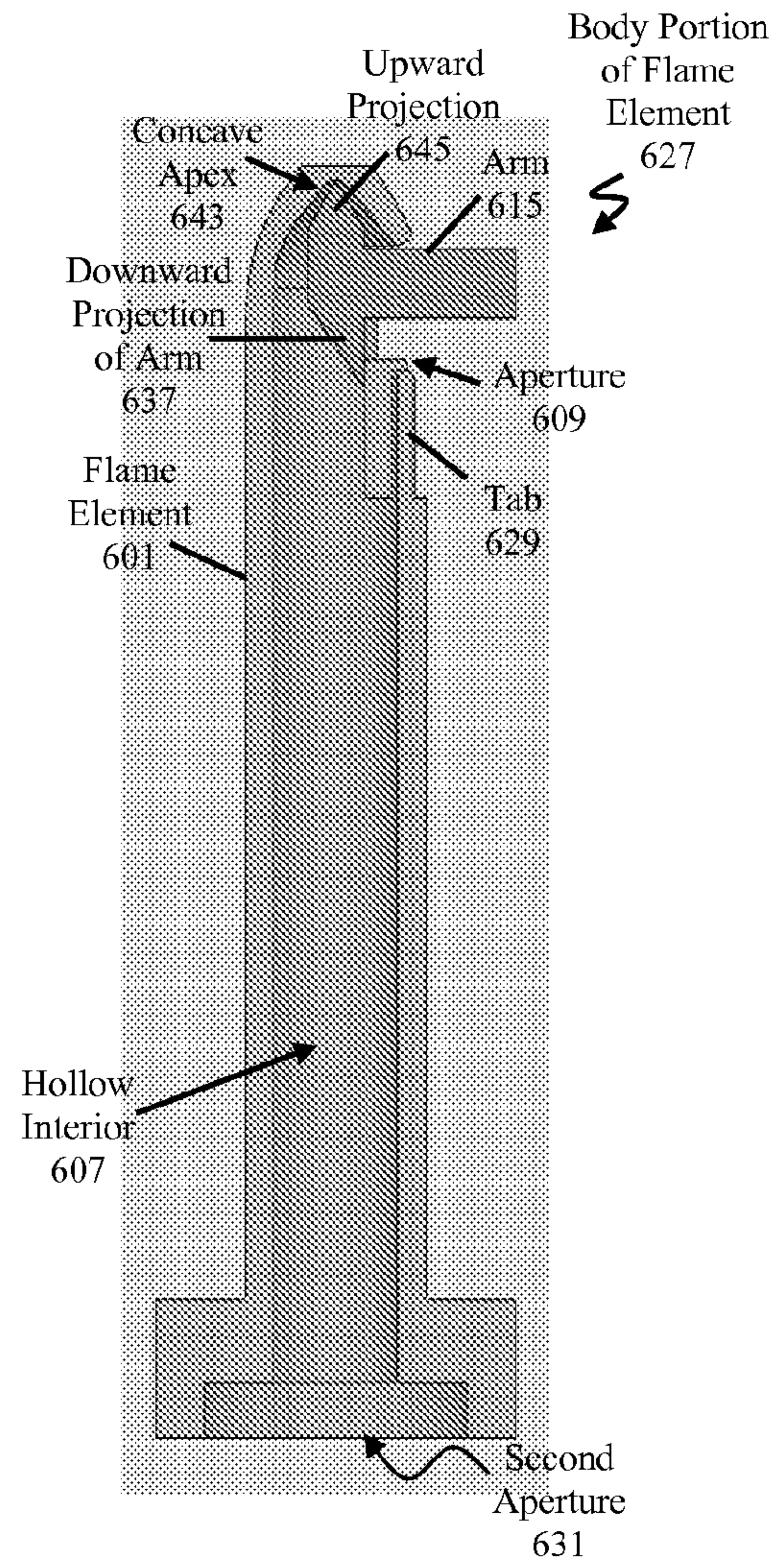
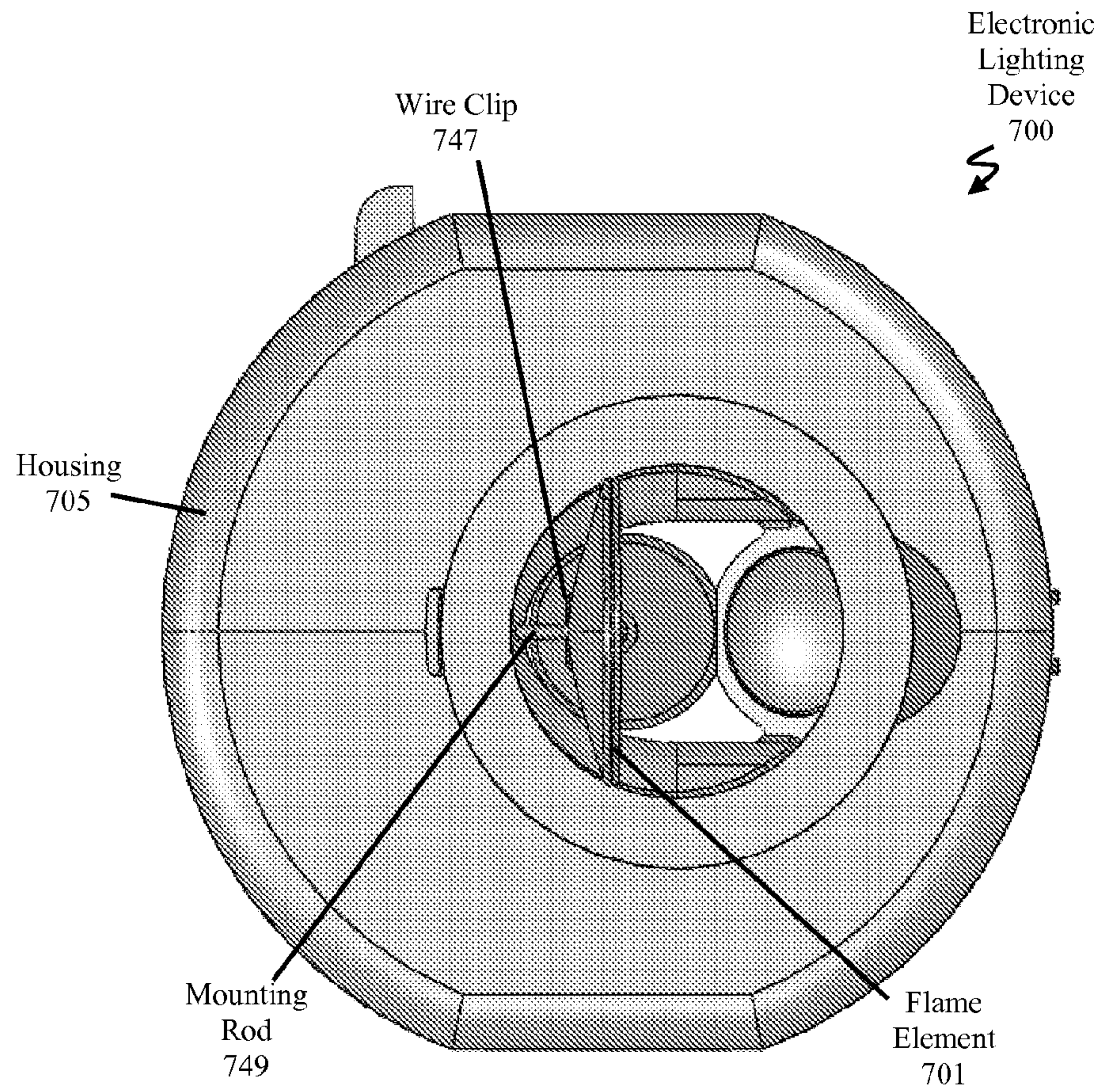


Figure 6B

**Figure 7A**

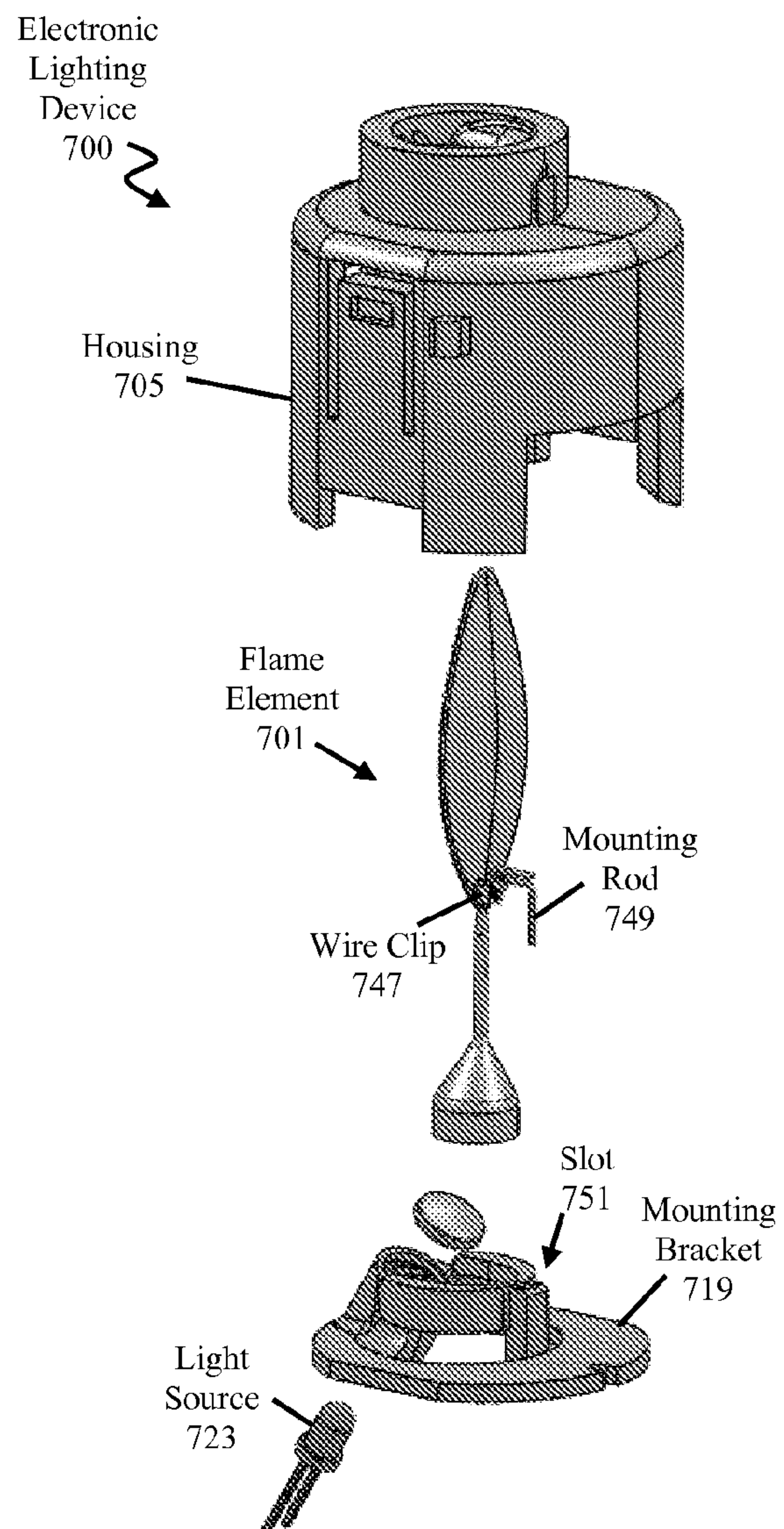
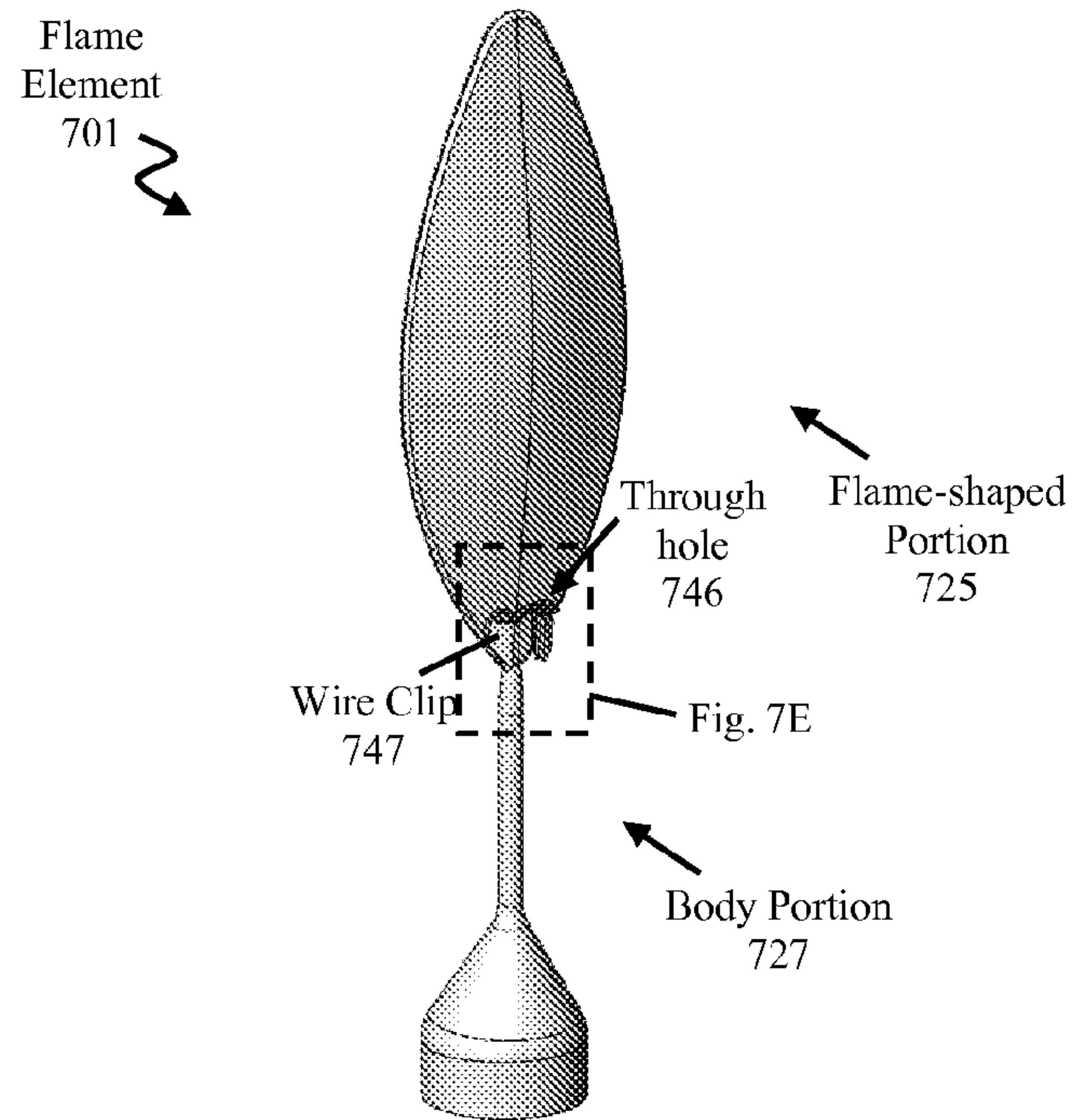
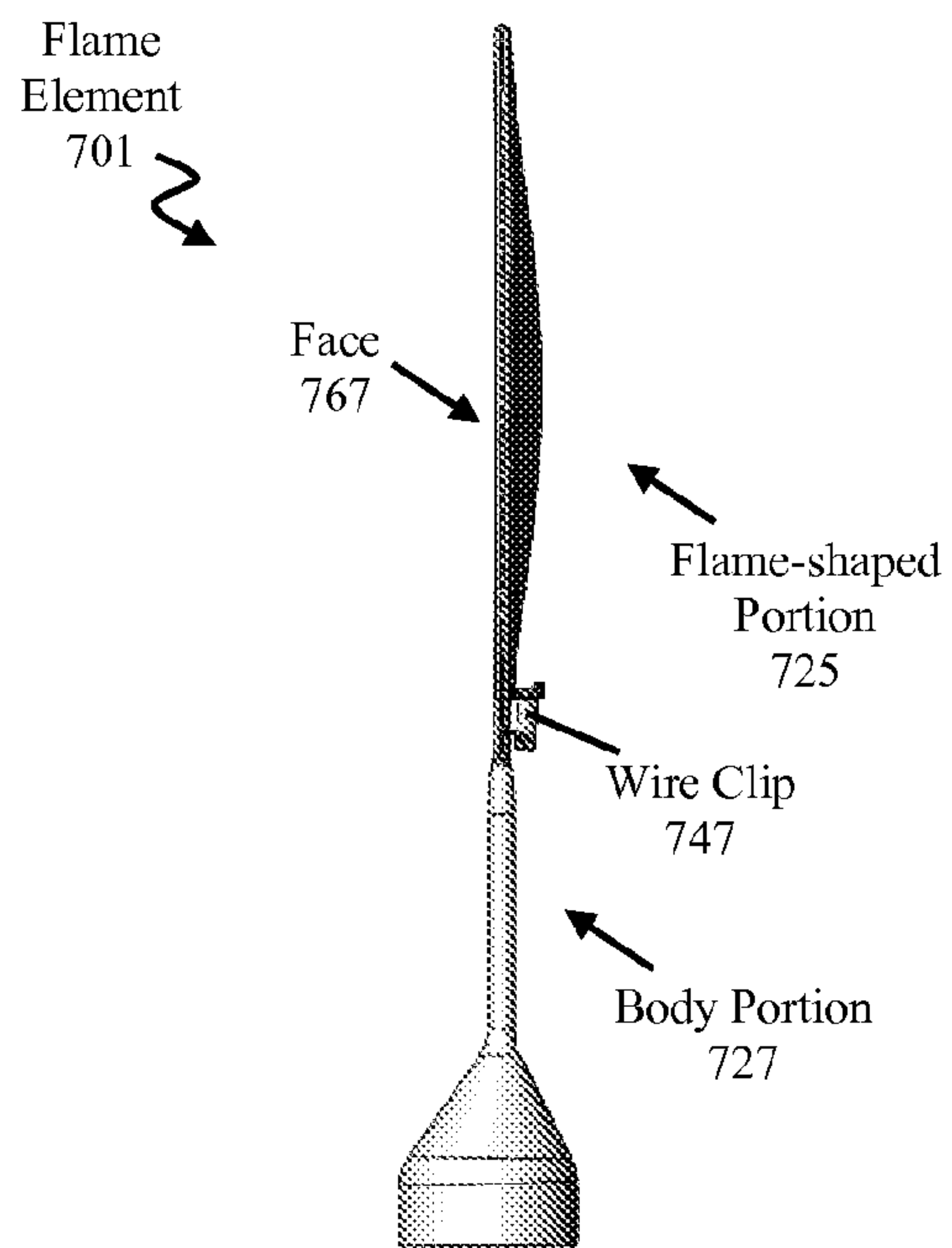


Figure 7B

**Figure 7C****Figure 7D**

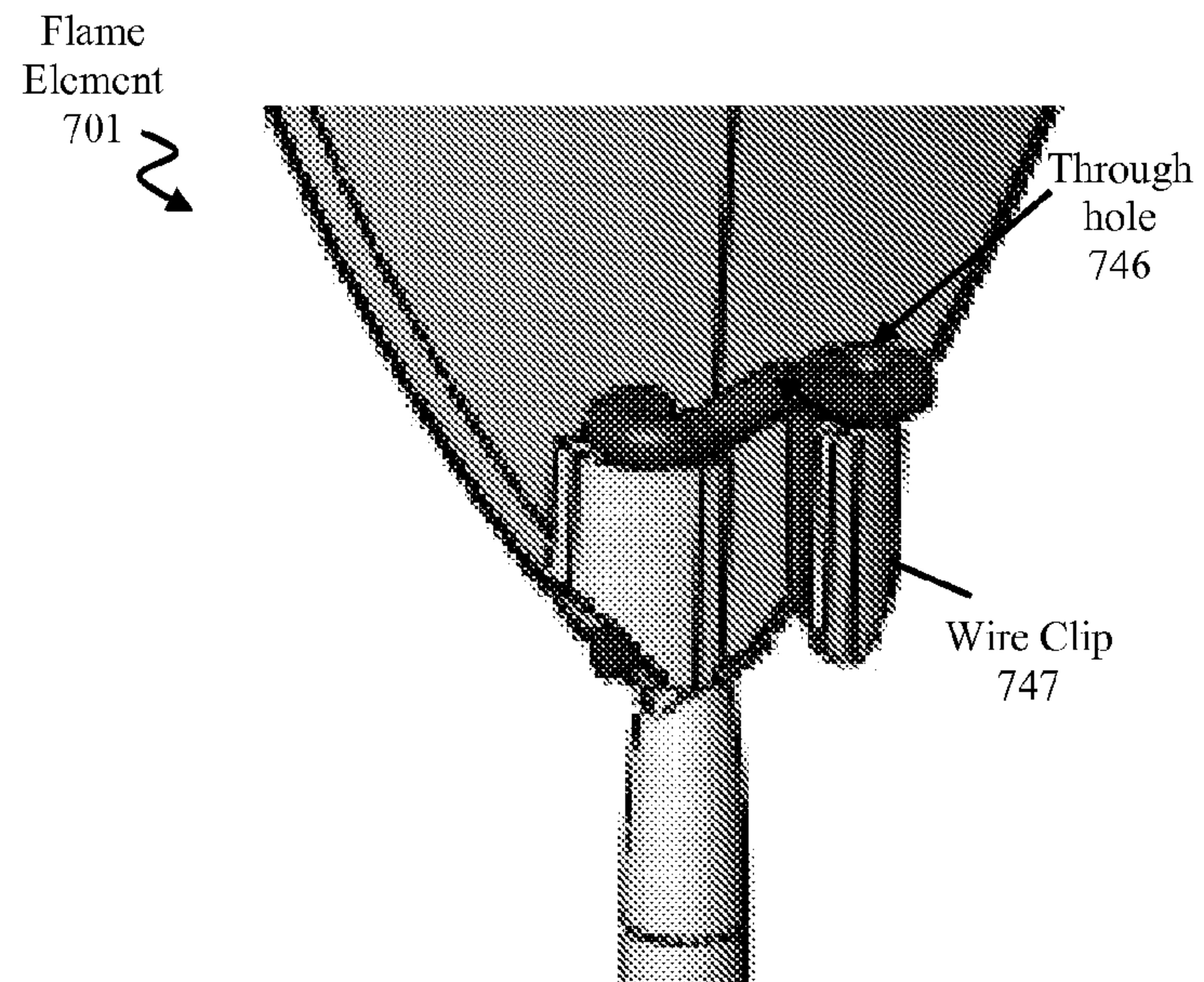


Figure 7E

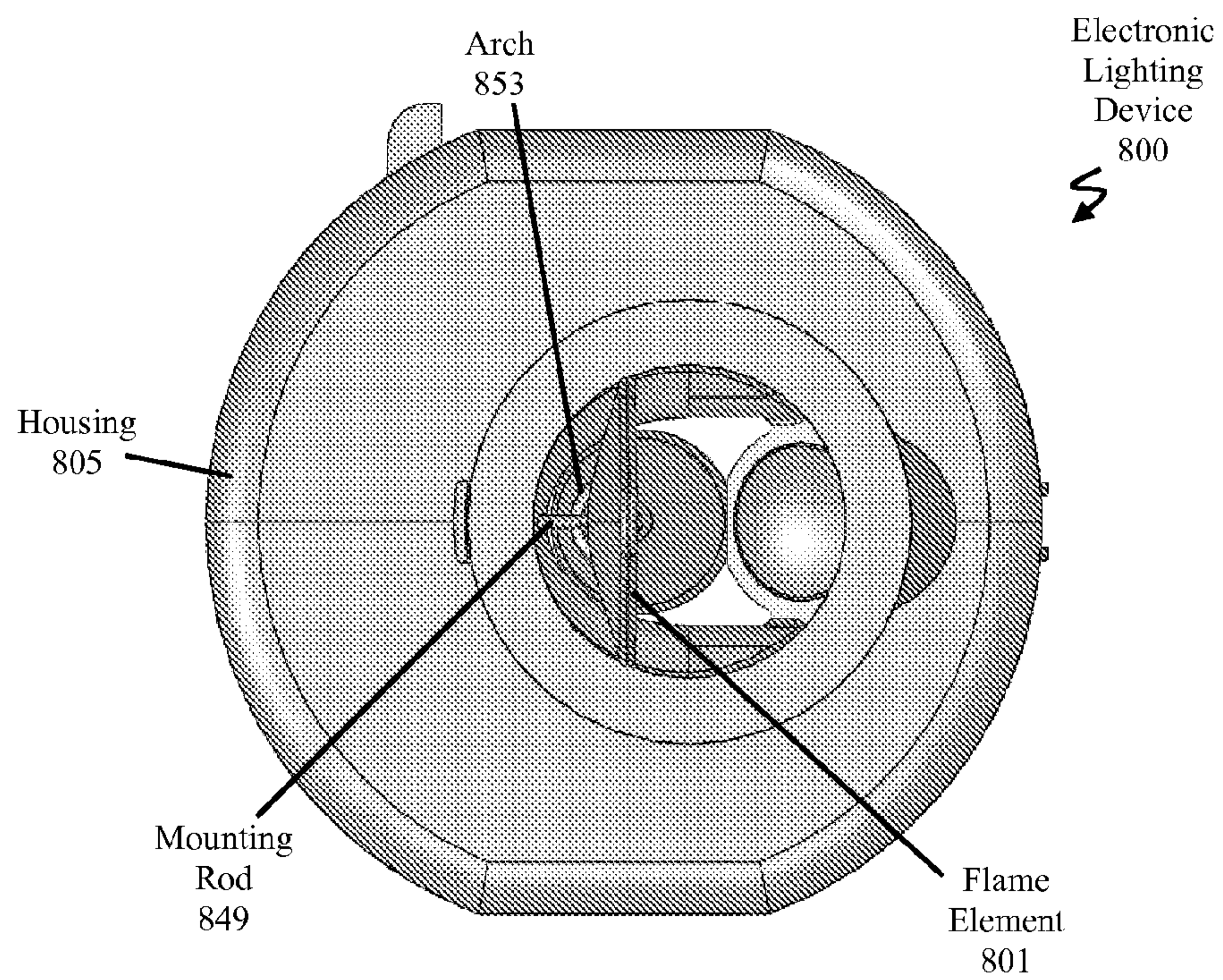
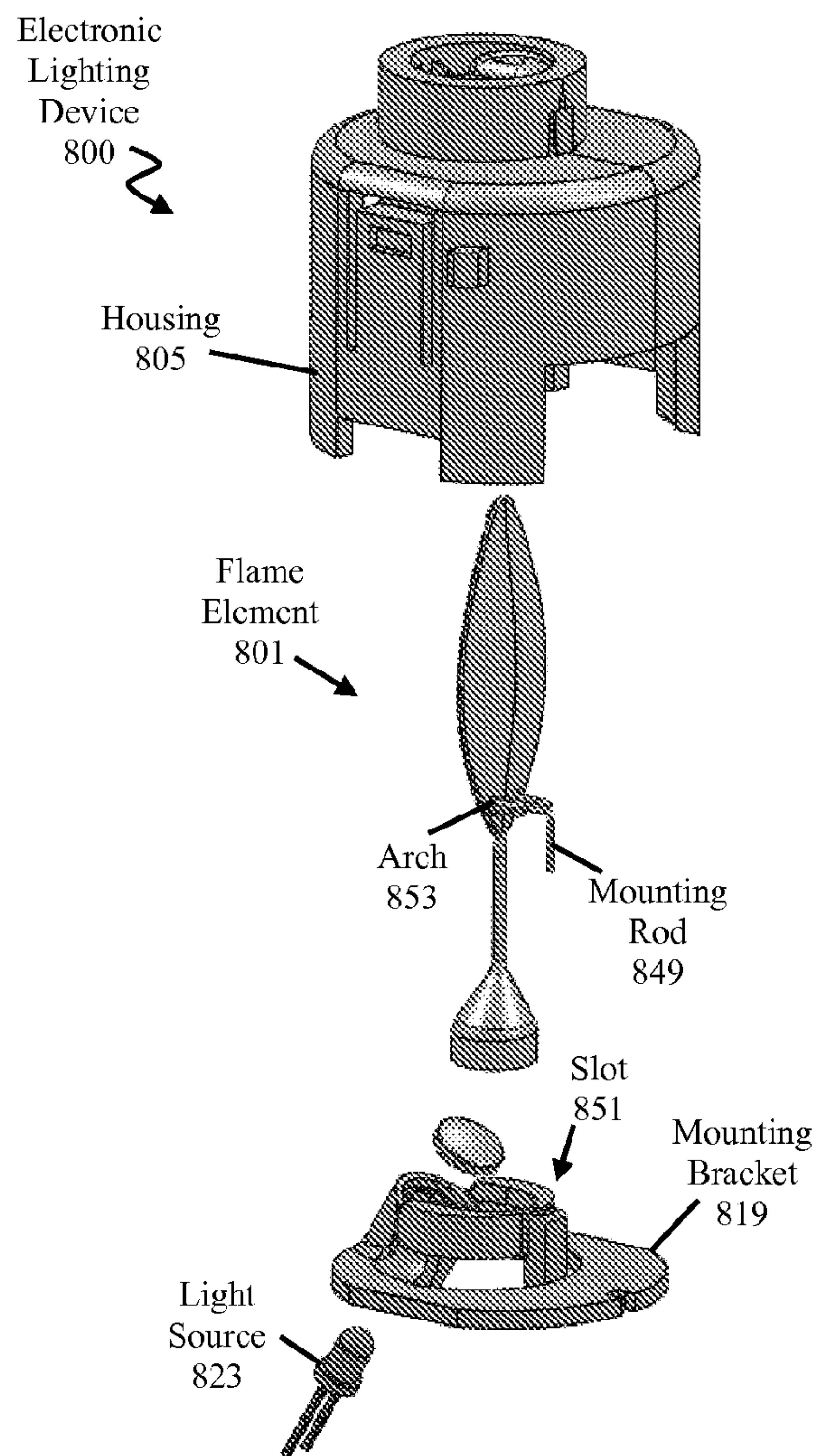


Figure 8A

**Figure 8B**

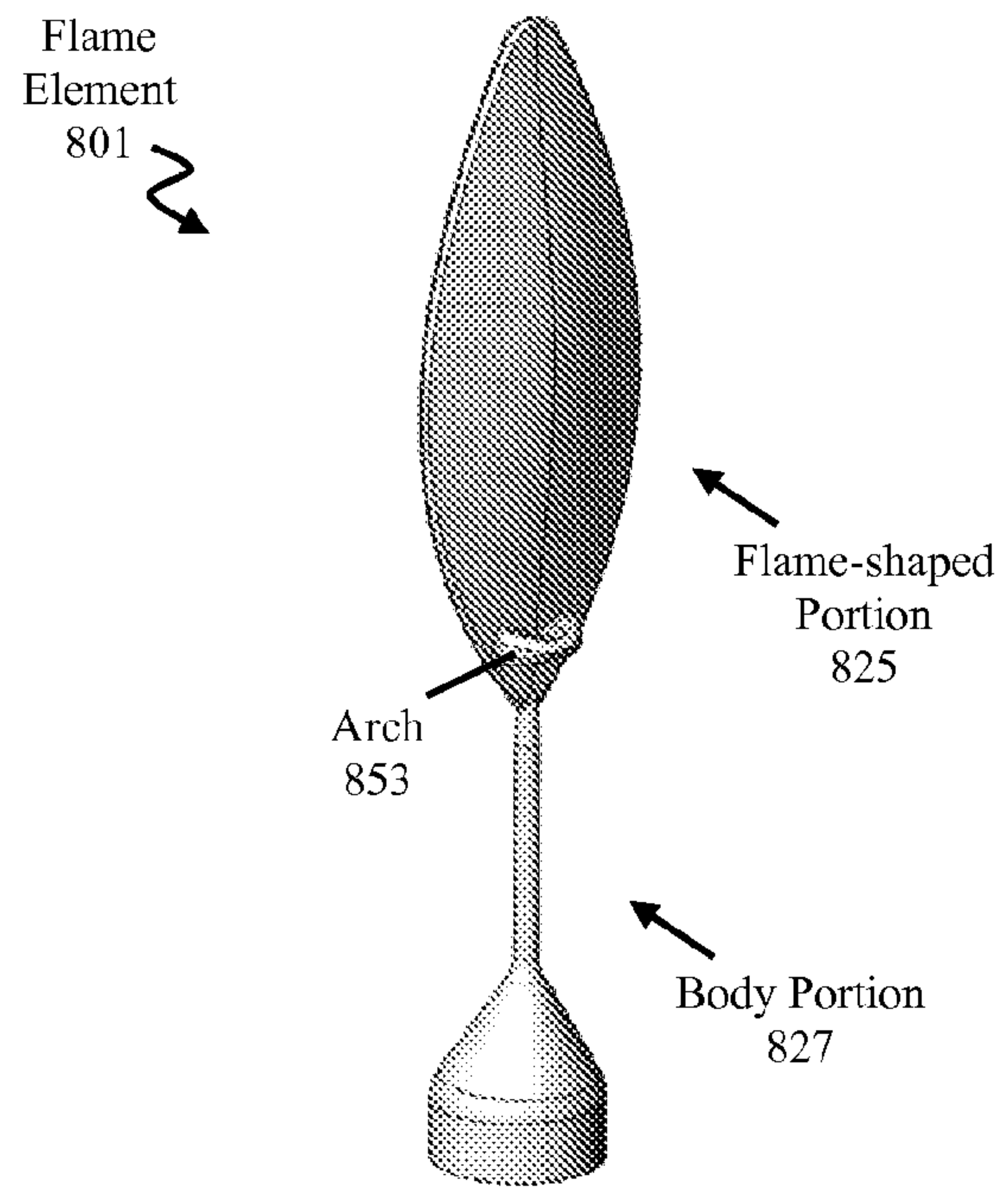


Figure 8C

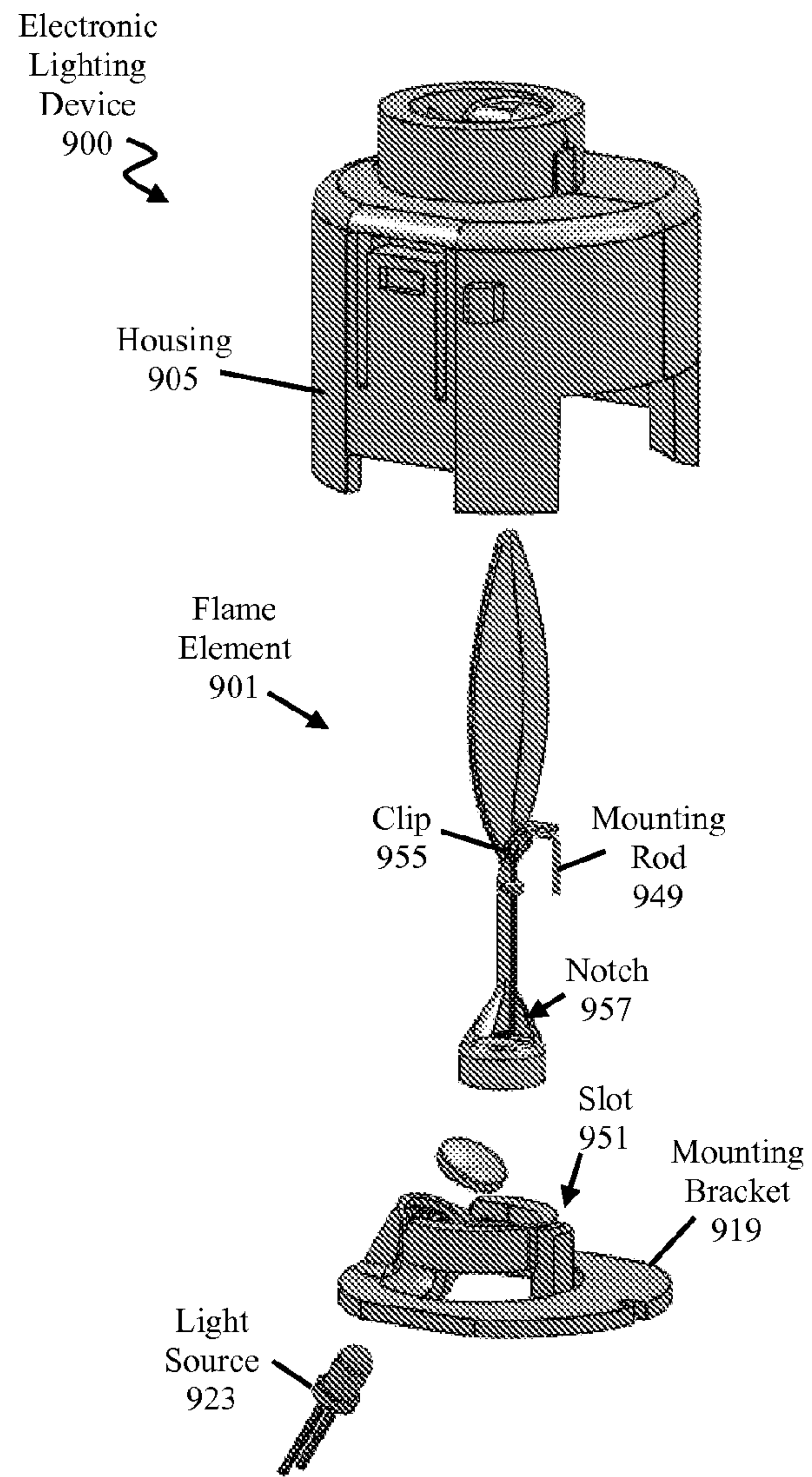


Figure 9A

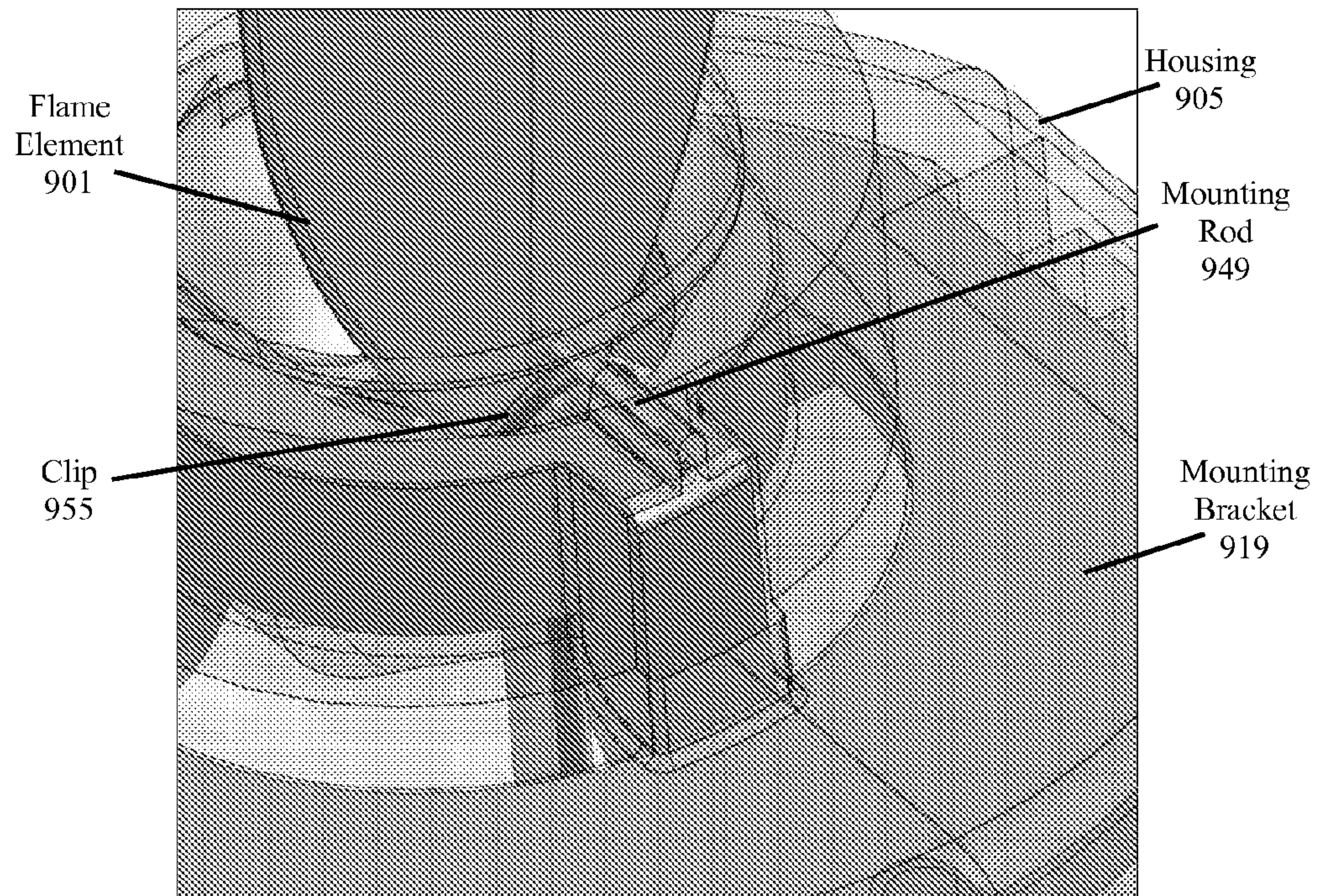


Figure 9B

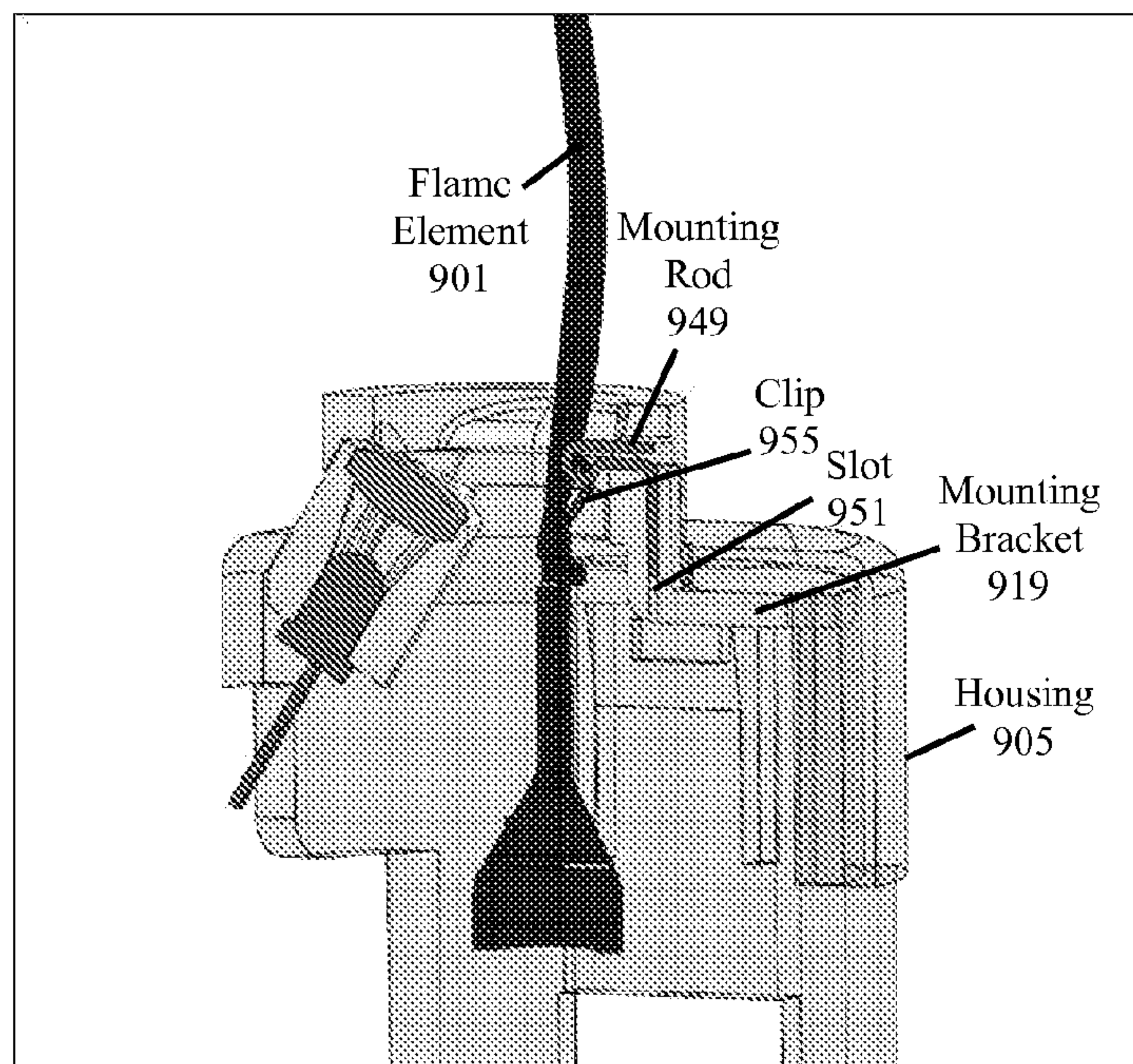
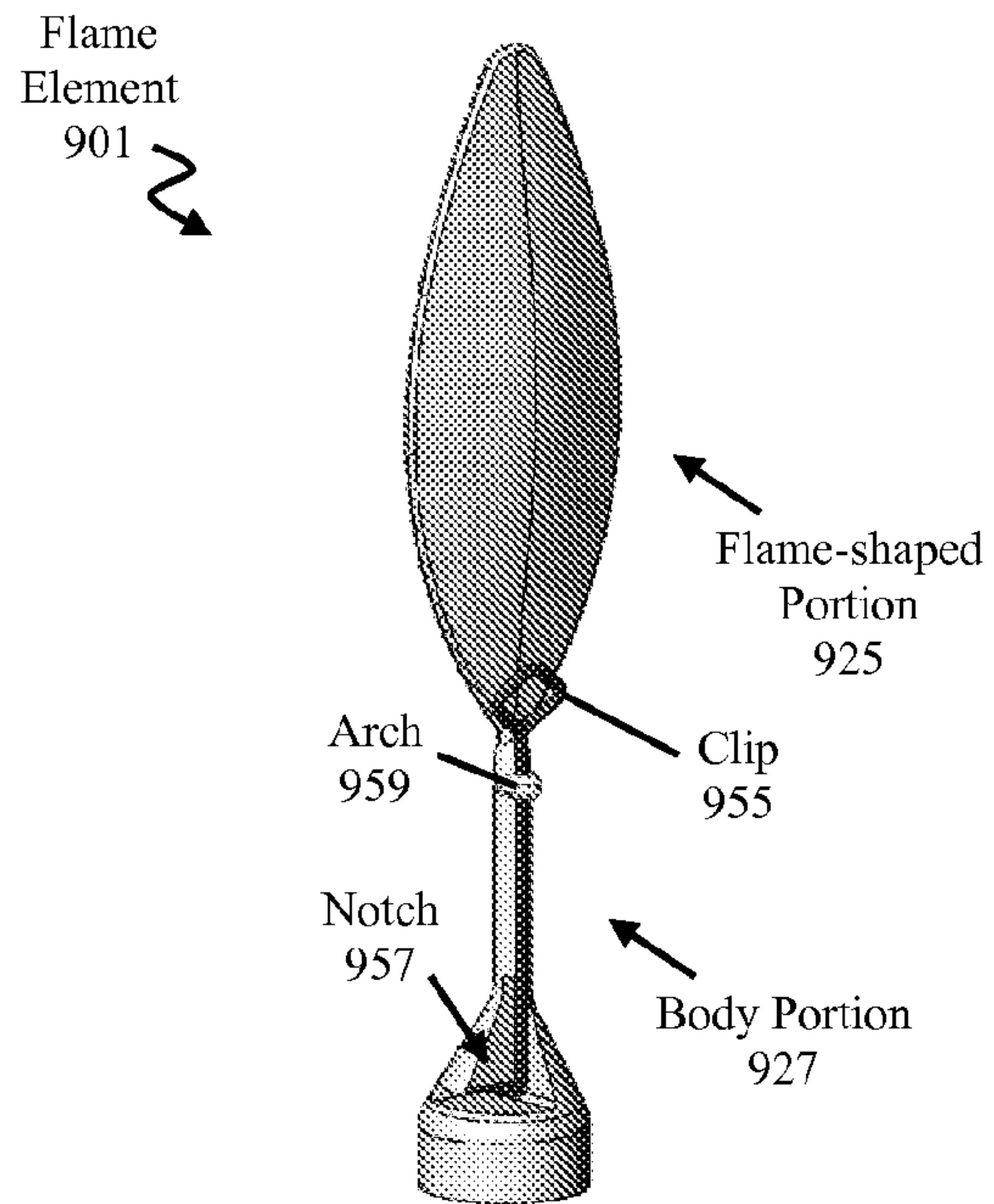
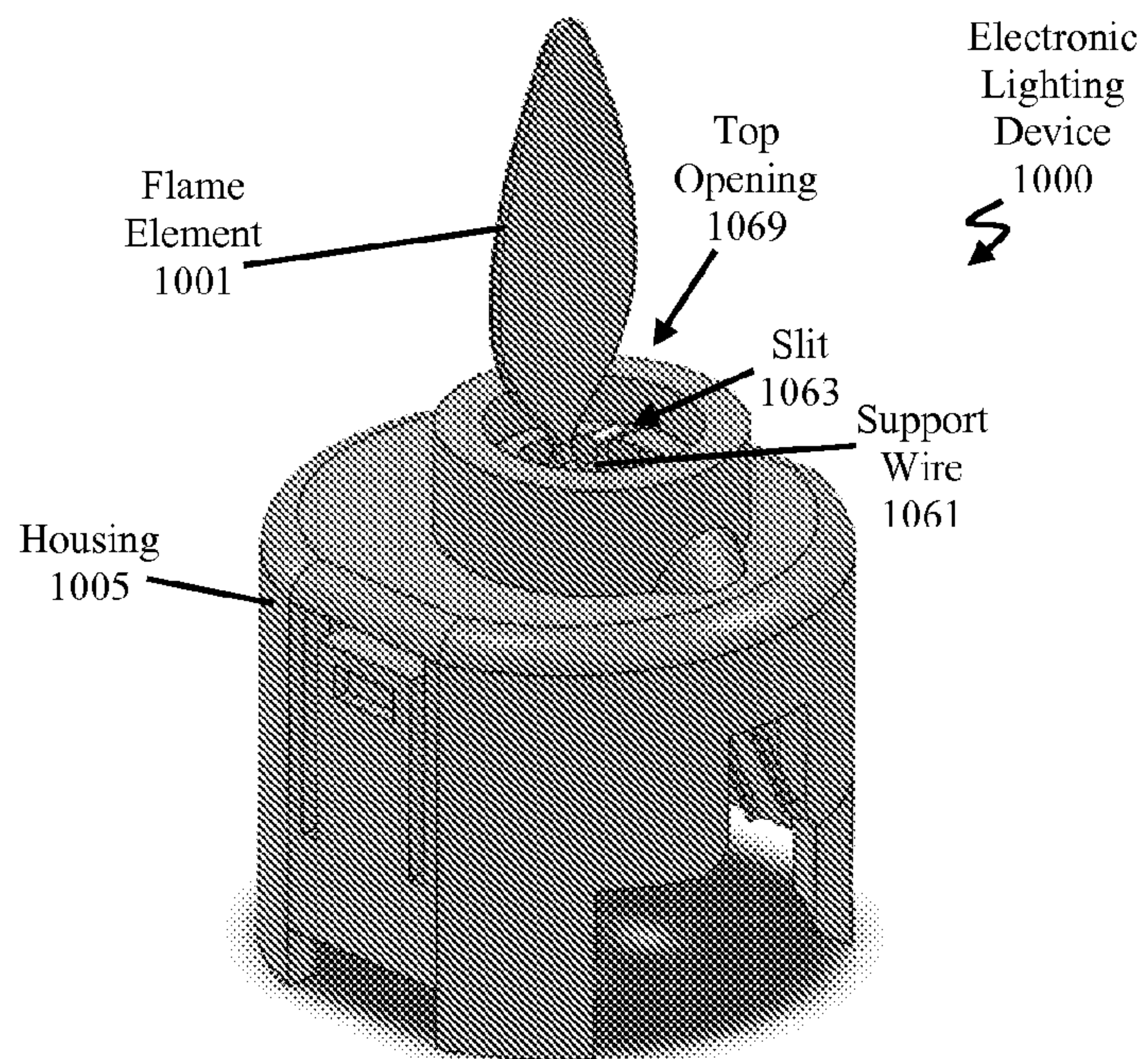


Figure 9C

**Figure 9D****Figure 10A**

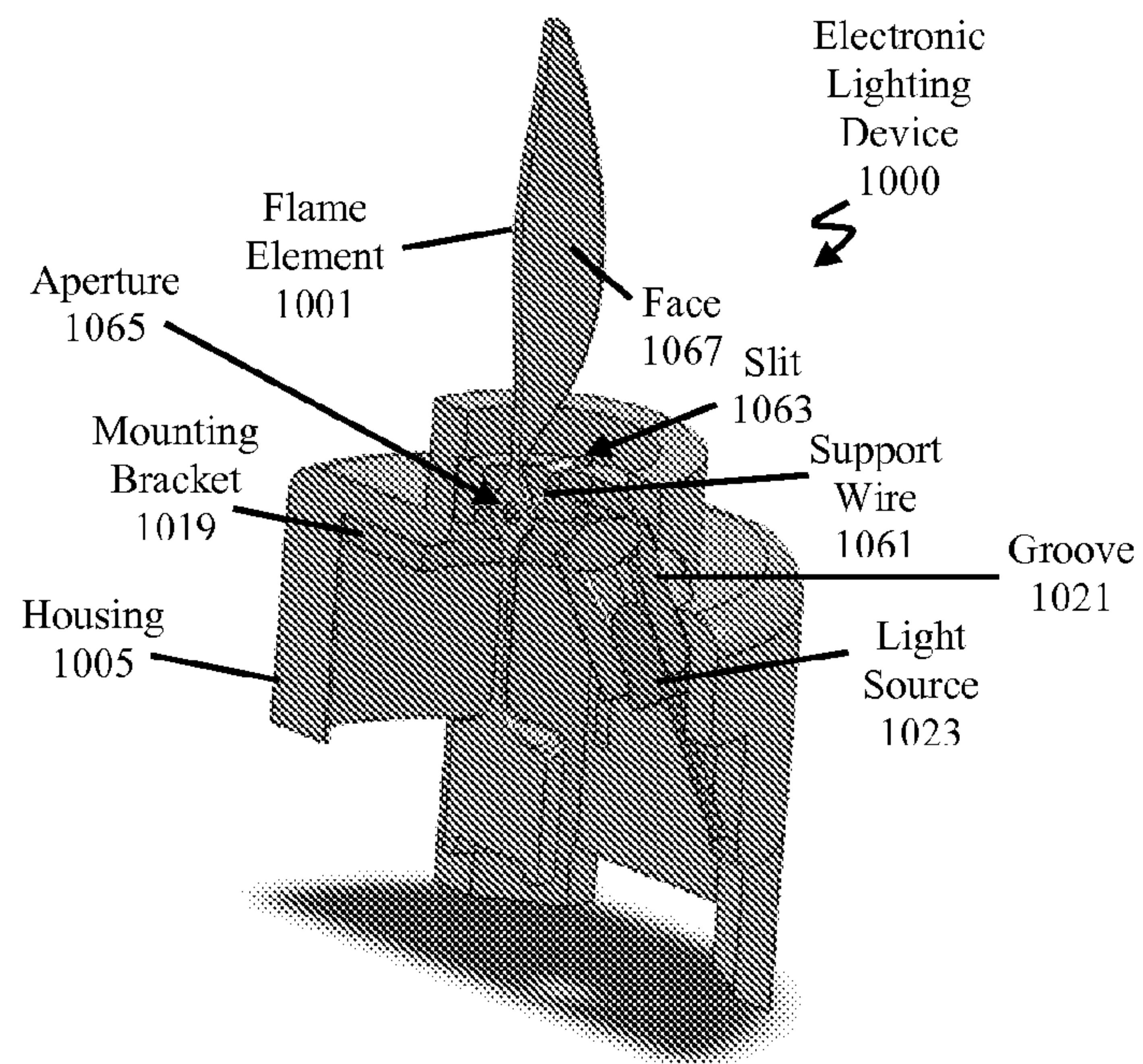


Figure 10B

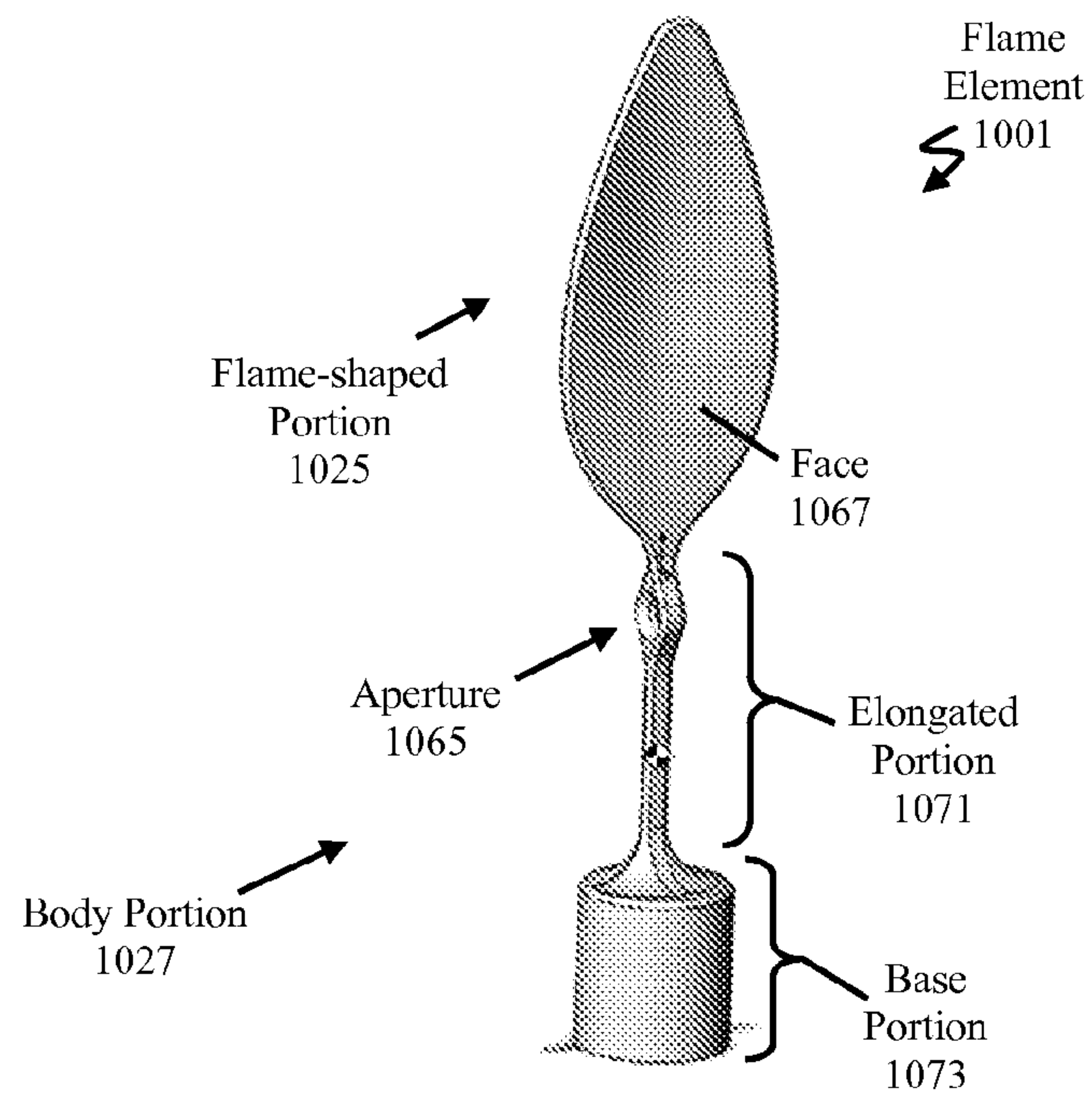


Figure 10C

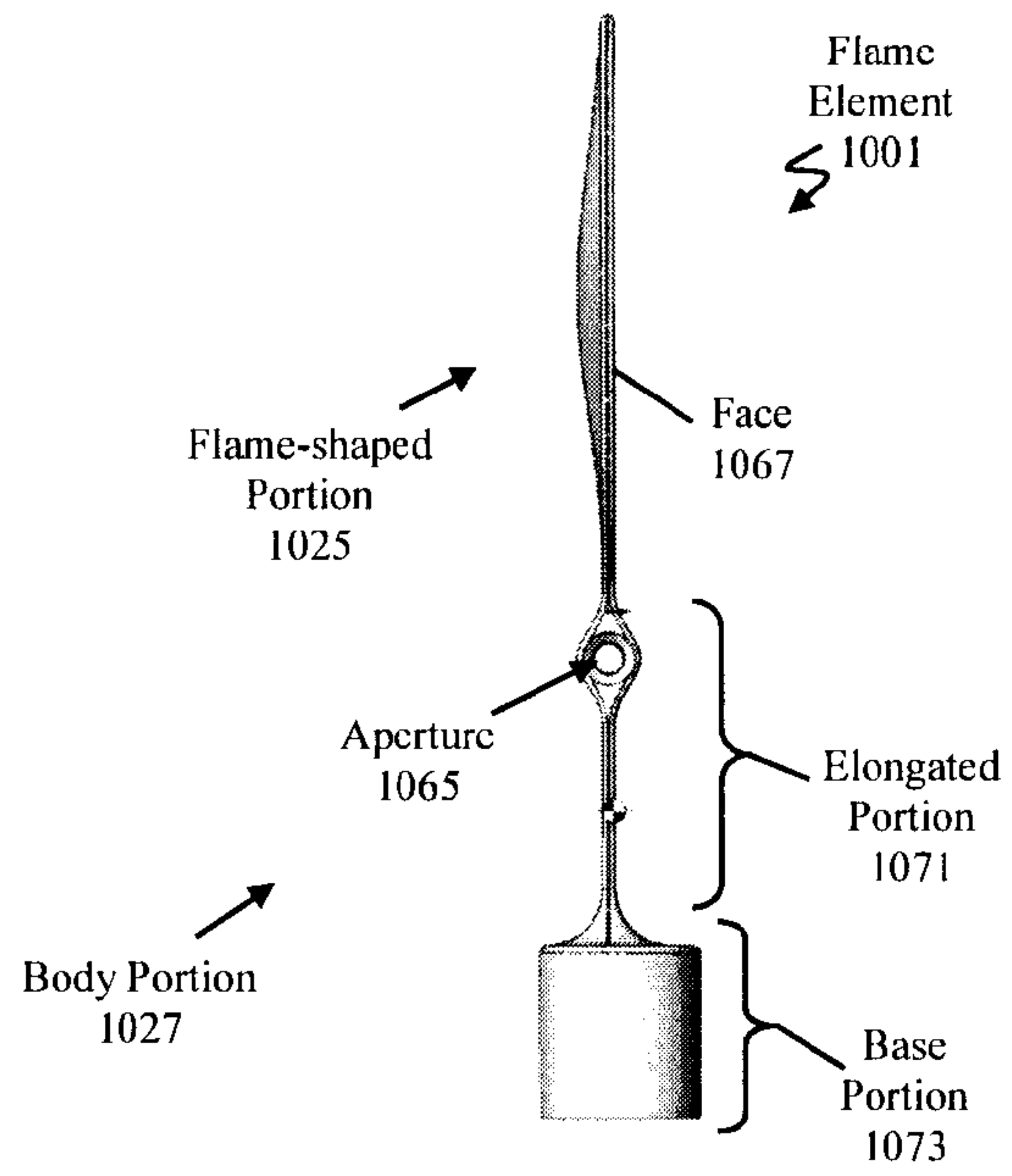


Figure 10D

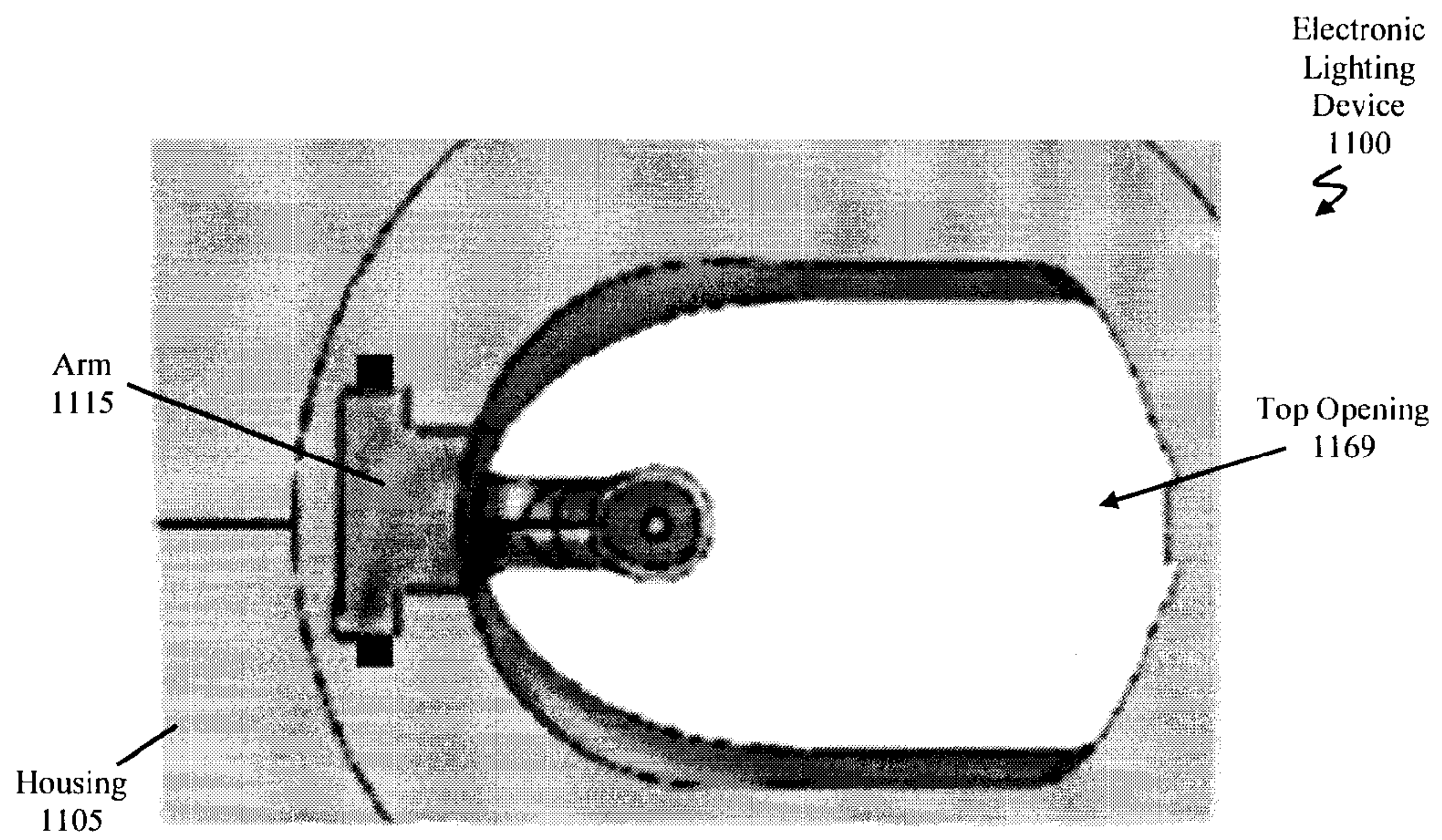
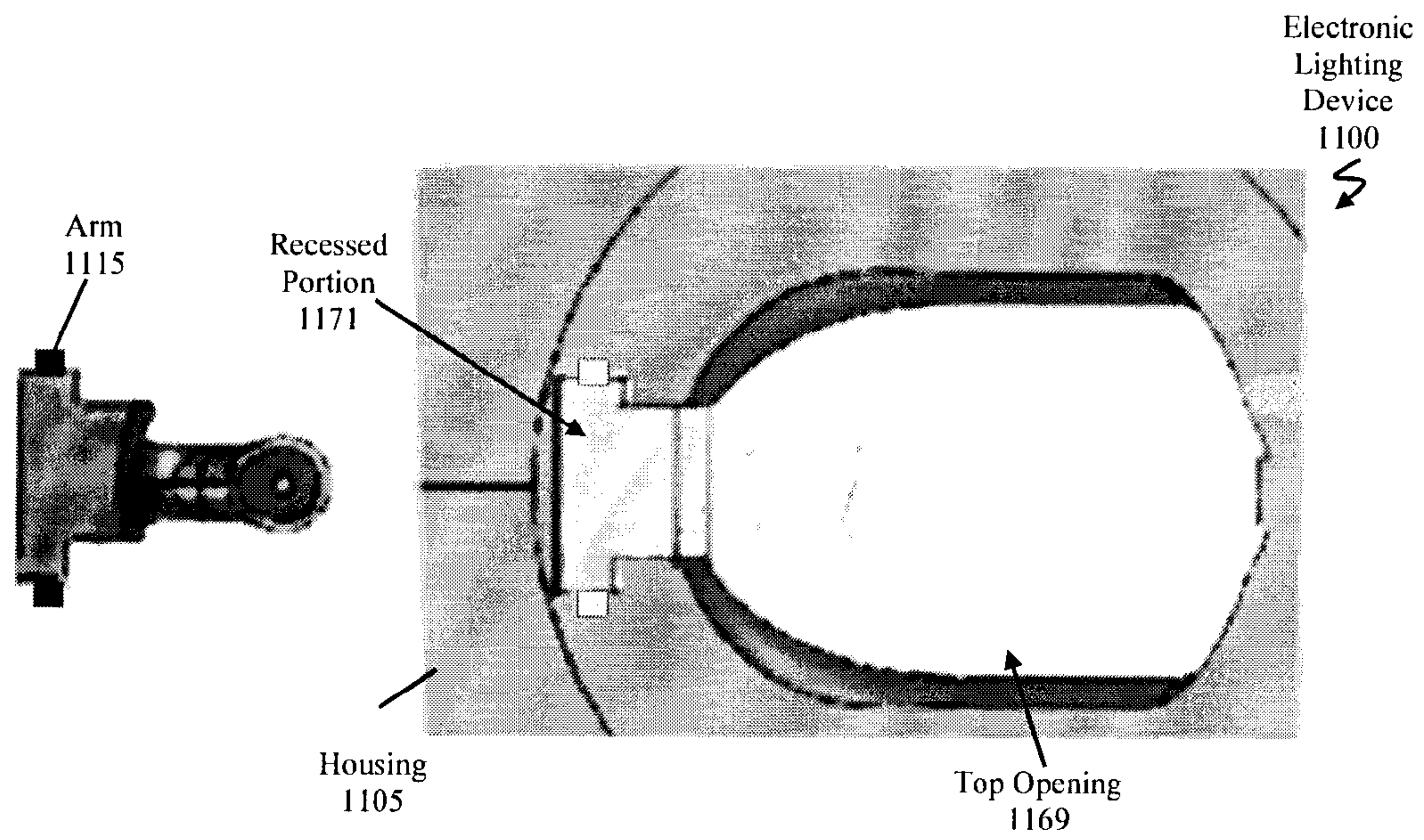


Figure 11A

**Figure 11B**

